H. F. SCHMIDT.

IMPULSE TURBINE.

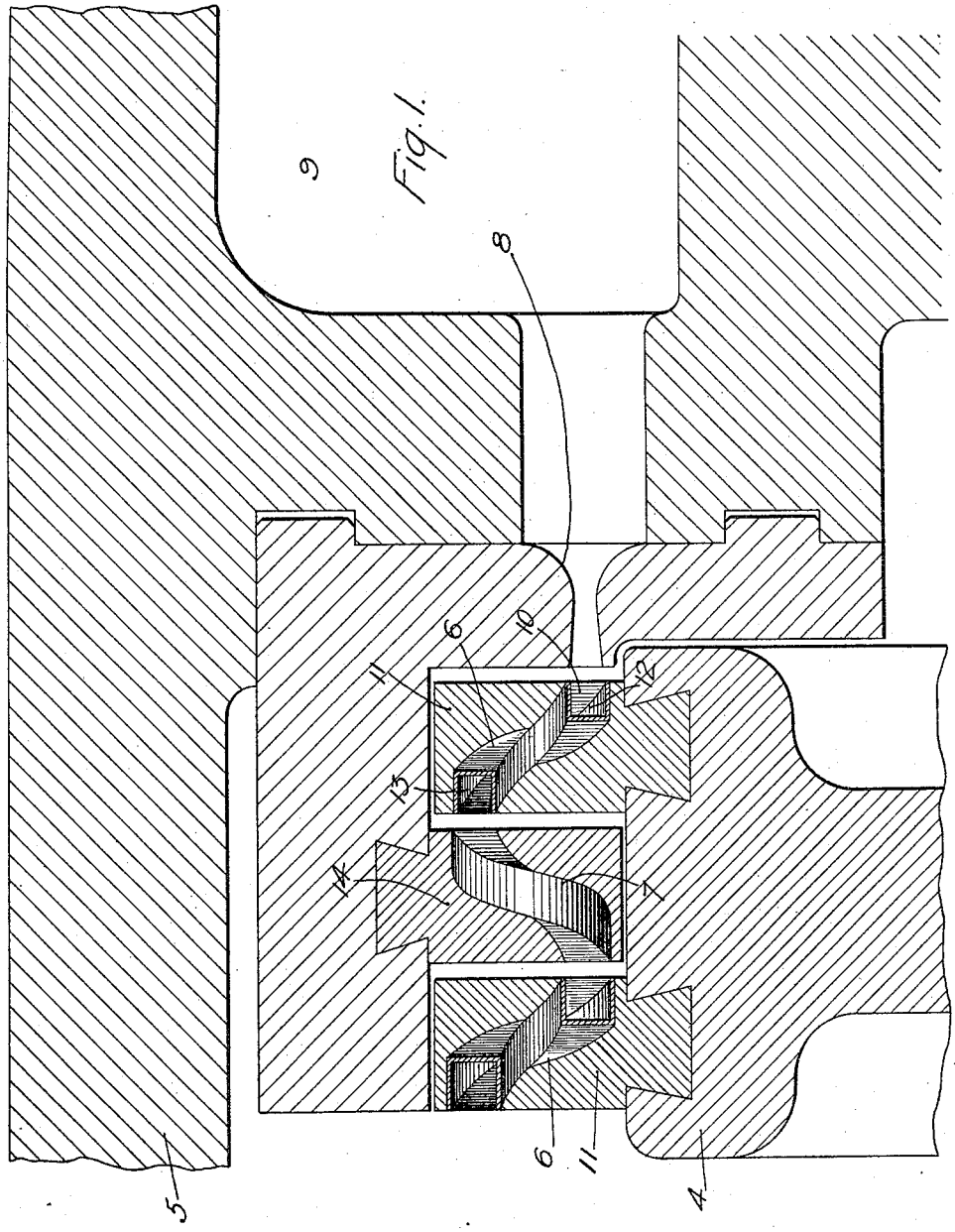
APPLICATION FILED AUG. 28, 1909.

1,148,994.

Patented Aug. 3, 1915.

2 SHEETS—SHEET 1.

Fig. 1.



WITNESSES:

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INVENTOR.

BY Henry F. Schmidt.

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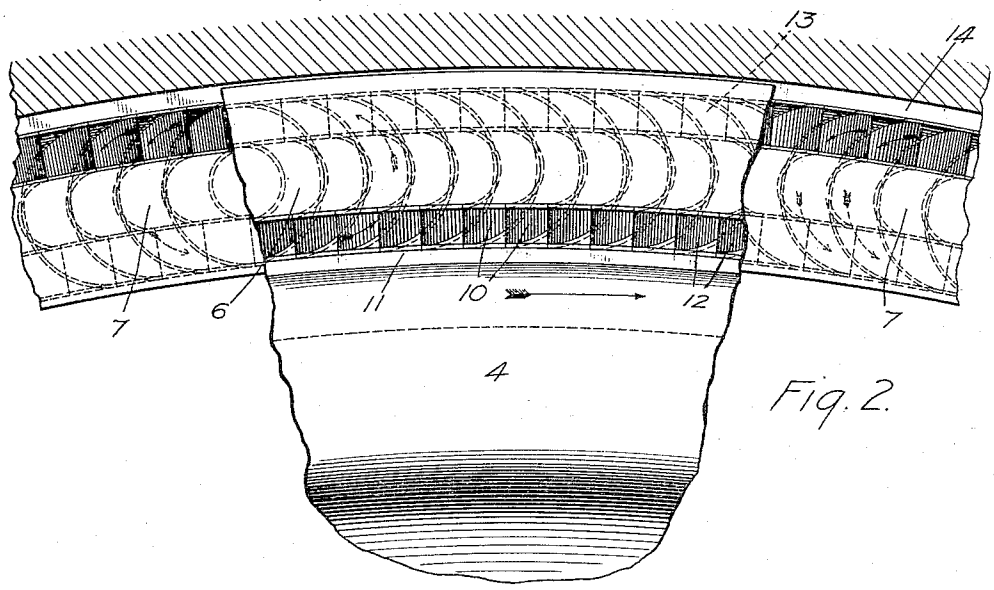


Fig. 2.

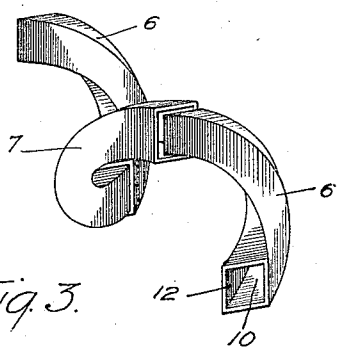


Fig. 3.

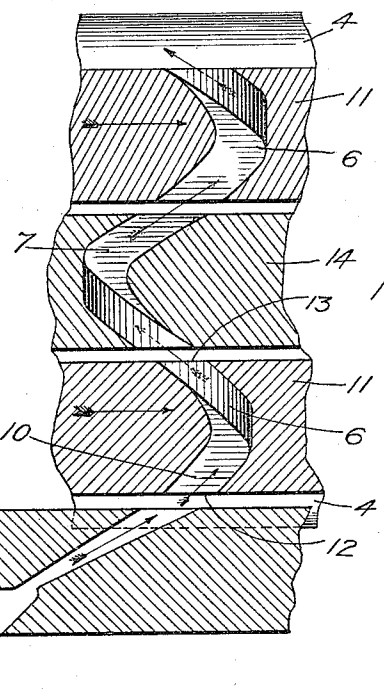


Fig. 4.

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HENRY F. SCHMIDT, OF PITTSBURGH, PENNSYLVANIA, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE COLONIAL TRUST COMPANY, TRUSTEE, OF PITTSBURGH, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

IMPULSE-TURBINE.

1,148,994. Specification of Letters Patent. Patented Aug. 3, 1915.

Application filed August 28, 1909. Serial No. 515,020.

To all whom it may concern:

Be it known that I, HENRY F. SCHMIDT, a citizen of the United States, and a resident of Pittsburgh, in the county of Allegheny and State of Pennsylvania, have made a new and useful Invention in Impulse-Turbines, of which the following is a specification.

This invention relates to turbines and has for an object to produce a turbine of increased efficiency.

A further object of my invention is to produce means whereby the molecules of the separate streams of motive fluid traveling the working passages of the turbine, travel in substantially parallel lines and in which the losses due to centrifugal compression are materially reduced.

A further object is to produce means for eliminating, as far as possible, the shock due to the sudden reversal of the motive fluid.

These and other objects I attain in a turbine in which the motive fluid is constantly turned in one direction. This result can only be accomplished by passing the motive fluid in a helical path through a number of working elements which unite to form helical passages. The helices traversed by the fluid may have their axes parallel to the shaft of the turbine thereby forming an axial flow turbine, or they may be perpendicular to the center line of the shaft thereby forming a radial flow turbine.

In the drawings accompanying this application and forming a part thereof: Figure 1 is a diagrammatic sectional view of a portion of a turbine embodying my invention; Fig. 2 is a partial end elevation of a wheel provided with blades or buckets embodying my invention; and Fig. 3 is a diagram illustrating the helical path taken by the motive fluid. Fig. 4 is a diagrammatic transverse sectional view of the apparatus shown in Fig. 2 and illustrates the arrangement of the helical passages.

Referring to the drawings, the turbine shown consists of a rotor element 4, a casing 5, rotating buckets 6 and stationary directing blades 7 carried by the rotor and the stator elements respectively, and a fluid delivery nozzle 8 which delivers motive fluid to the buckets and blades. The nozzle 8 communicates with a passage 9 formed in the casing and receives motive fluid therefrom. The rotating buckets 6 and the stationary blades 7 are so constructed that the motive fluid delivered by the nozzle 8 is caused to travel a substantially continuous helical passage while imparting the energy to the turbine. The first row of buckets 6 consists of a series of helical ducts or passages 10 located side by side and secured to a blade strip 11 so that the inlets 12 are located side by side on one side of the strip and the outlets 13 are located side by side on the other side of the strip nearer the circumference of the wheel. Each passage increases in cross-sectional area from the inlet to the outlet and reverses the direction of the flow of the fluid stream delivered by the nozzle 8 and traversing it. The first row of buckets delivers motive fluid to the stationary blades 7 which, like the rotating buckets, consist of helical ducts or passages located side by side and secured in place in a base strip 14 which is secured to the stator or casing of the turbine. The inlet of the stationary blades registers with the outlet of the first row of rotating buckets and the separate passages increase in cross-sectional area from the inlet to the outlet end. The stationary blades deliver fluid to the second row of rotating buckets 6 which is similar to the first row of buckets except that the passages are of greater cross-sectional area. Any number of rows of buckets and blades may be employed and any number of nozzles 8 may be provided. The separate streams of fluid delivered by the nozzles 8 to the first row of buckets are reversed in the direction of their flow in traversing the buckets and consequently are subjected to a degree of centrifugal compression which corresponds to the velocity of the fluid and to the amount of curvature of the blade passages. This compression, no matter how slight, is detrimental and occasions a loss in efficiency. In ordinary turbines the motive fluid traversing the working passages is reversed first in one direction and then in the other so that it is subjected to a number of centrifugal compressions, each one of which occasions additional losses. With my invention the fluid continues in a helical path and is not subjected to a number of reversals, and consequently the fluid is compressed but once by the centrifugal force and the losses resulting therefrom are relatively small as compared to other types of turbines.

The delivery angle of the nozzle 8 is such that the fluid enters the first row of buckets 6 with little or no shock and since the communicating blades are, in fact, sections of a helix, the fluid will be delivered from the rotating buckets to the stationary blades and from the stationary blades to the rotating buckets without shock. Moreover, the molecules of the separate streams of fluid traversing the working passages, will travel in substantially parallel lines, for the reason that the entrance faces of each passage are substantially parallel to each other and to the delivery faces of the delivering passage of the next preceding row of blades or buckets. This is important as it eliminates difficulties and losses due to eddy currents which result from the intermingling of fluid traveling at different velocities through the same passages.

I know that helical or spiral guide passages have been employed in turbines. My invention differs from the arrangement of such turbines in that the motive fluid traversing one passage is not mixed with fluid traveling at a lower velocity and consequently the efficiency of my turbine is higher. In all the turbines known to me which employ the helical guide passages, it is impossible to avoid having one bucket or blade or passage partly under one delivering passage and partly under another from which jets of fluid are issuing at two different velocities. As I have said, such an arrangement is detrimental to the efficiency of the turbine for the reason that mixing fluids traveling at two different velocities occasions a loss of part of the kinetic energy which was available prior to the shock of intermingling the fluids.

The blades and buckets may be constructed from tubing of any desired cross section, which may be bent into a helical or other suitable form. The tubing may then be assembled as described above and a mass of bronze or brass cast about them to form the blade or base strips 11 and 14. These strips may be formed in any desired lengths and be secured to the elements of the turbine in any well known suitable manner.

In accordance with the provisions of the patent statutes, I have described the principle of operation of my invention, together with the apparatus which I now consider to represent the best embodiment thereof, but I desire to have it understood that the apparatus shown is only illustrative and that the invention can be carried out by other means.

What I claim is:

1. In a turbine, a fluid delivery nozzle and alternate annular rows of moving and stationary helical working passages for the fluid issuing from said nozzle.

2. A turbine, fluid delivery nozzles and means for causing the fluid delivered from said nozzles to traverse the working passages of said turbine in a number of separate parallel helical streams.

3. A turbine, a fluid delivery nozzle, alternate rows of moving and stationary blades comprising helical passages whereby the fluid delivered from said nozzle is caused to traverse the working passages of said turbine without being reversed in direction.

4. A turbine, a fluid delivery nozzle, alternate rows of moving and stationary helical passages receiving the fluid from said nozzle whereby the fluid is constantly turned in one direction while traversing said passages.

In testimony whereof, I have hereunto subscribed my name this 16th day of August, 1909.

HENRY F. SCHMIDT.

Witnesses:
CHARLES W. MCGHEE,
GEO. A. WALKER.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."