G. B. PETSCHE.

TURBINE.

APPLICATION FILED JULY 14, 1920.

1,412,257. Patented Apr. 11, 1922.

Fig. 1.

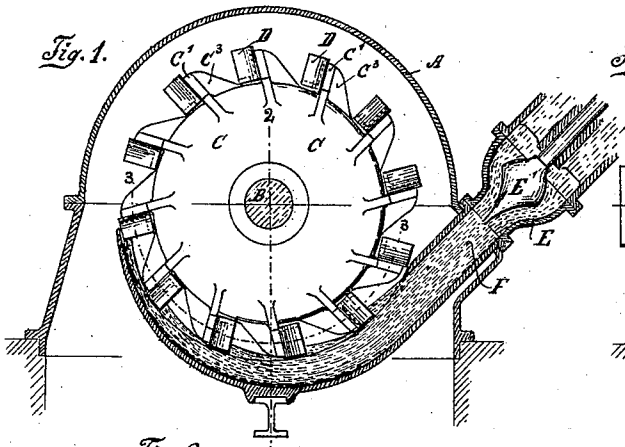


Fig. 2.

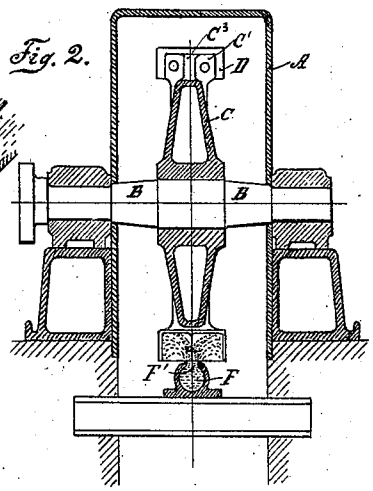


Fig. 3.

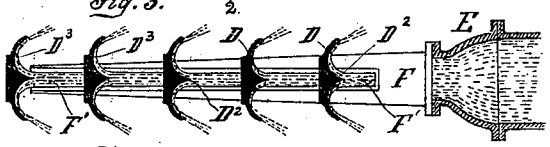


Fig. 8.

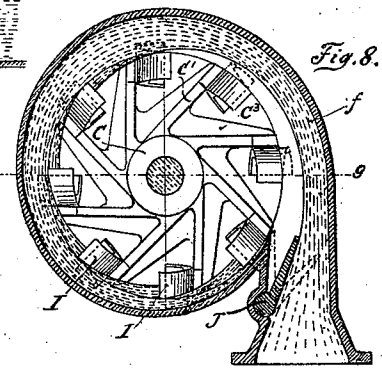


Fig. 7.

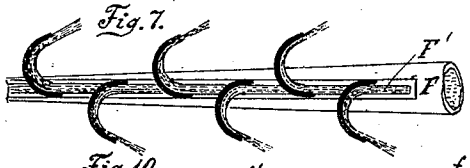


Fig. 10.

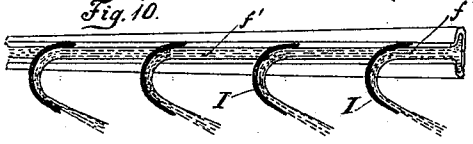


Fig. 4.

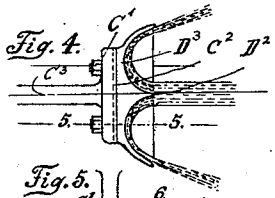


Fig. 6.

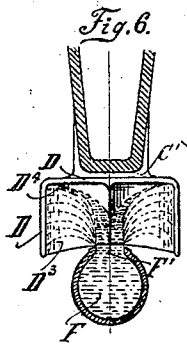


Fig. 5.

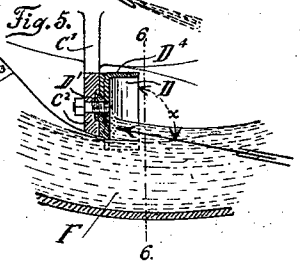
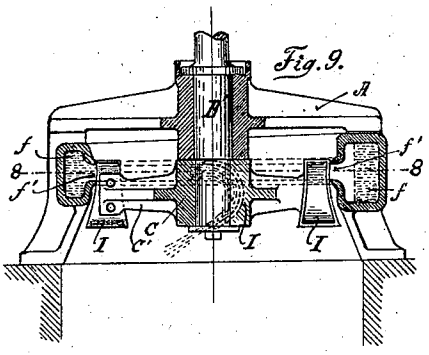


Fig. 9.



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TURBINE.

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To all whom it may concern:

Be it known that I, GUSTAV B. PETSCHE, a citizen of the United States of America, and resident of Yonkers, in the county of Westchester and State of New York, have invented a certain new and useful Improvement in Turbines, of which the following is a true and exact description, reference being had to the accompanying drawings, which form a part thereof.

My invention relates to turbine wheels in which a fluid jet of high velocity is used as the impelling means and it has for its main object to provide a turbine construction having in connection with means for converting the pressure of a fluid into velocity a nozzle extension of decreasing sectional area extending around the wheel and having a narrow slot like opening through which the fluid issues into the buckets in a narrow jet, the buckets being of the jet reversing type and set with their jet receiving edges approximately tangential to the narrow jet.

Reference being now had to the drawings in which my invention is illustrated.

Figure 1 is a side elevation of a Pelton wheel turbine provided with my improvement, a portion of the casing being removed to show the side of the wheel and the nozzle and nozzle extension being shown in section.

Figure 2 is an elevation of the construction shown in Fig. 1 taken as on the section line 2—2 of Fig. 1.

Figure 3 is a plan view taken as on the section line 3—3 of Fig. 1.

Figure 4 is a somewhat enlarged detailed view showing one of the buckets of the wheel and illustrating the motion of the jet over the buckets.

Figure 5 is a view taken on the section line 5—5 of Fig. 4 the section being continued through the nozzle extension and showing the angle with which the jet portion comes in contact with the bucket.

Figure 6 is a sectional view taken as on the line 6—6 of Fig. 5 and illustrating the travel of the fluid over the face of the bucket.

Figure 7 is a view illustrating a modification of the bucket arrangement with reference to the opening of the nozzle extension which is of special utility where narrow and very high velocity jets are employed.

Figure 8 is a plan view of a turbine of the Pelton wheel type set horizontally and provided with my nozzle extension and with a bucket arrangement which is of a special value in connection with low heads of water. In this view the turbine wheel is not sectioned but the section is taken through the nozzle extension on the line 8—8 of Fig. 9.

Figure 9 is a sectional view taken as on the line 9—9 of Fig. 8 and

Figure 10 is a diagrammatic view illustrating the arrangement of the buckets in the wheel shown in Figs. 8 and 9.

A, Figs. 1 and 2, is the casing of the Pelton wheel; B is the shaft of the wheel; C, a wheel which is formed, as shown, with projecting bucket holding arms C′ reinforced by shoulders as indicated at C^3. D indicates the buckets which are secured to the arms C′ and which, as shown in Figs. 1, 2 and 3, are of the usual type of jet reversing buckets made double with a single dividing edge as indicated at D^2. These buckets are made preferably with projecting ribs D′ on their back, see Fig. 5, which extend into slots C^2 on the arms C′ and are secured in place by screws. The curved faces of the buckts are indicated at D^3 D^3, see Fig. 4, and the buckets are formed with the top portions as indicated at D^4. E indicates the nozzle by means of which the pressure of the fluid is converted into velocity, the nozzle is made regulable as by an adjustable cone or similar device indicated at E′. F indicates my nozzle extension which extends from the nozzle E around the whole or any desired part of the wheel and is formed with gradually contracted area so that the high velocity jet entering from the nozzle will be directed by the curved form of the extension inward toward the wheel and will issue through the opening or slot on the inner face of the extension. In my construction this slot is made narrow so that the jet issuing through it will be narrow. It will be observed that whatever portion of the narrow high velocity jet is forced into contact with the buckets of the wheel will contact with each bucket at the same angle and will continue in contact with the bucket at that same angle, x in Fig. 5, so long as the bucket remains in communication with the slot or opening of the nozzle extension. The jet reversing bucket or buckets are so located that their jet receiving edges, by which I mean that portion of the concave face of the bucket against which the jet first impinges, are approximately tangent to the narrow jet issuing from the slot.

In the modification of my invention shown

in Figs. 8 and 9, the turbine wheel here shown contrary to the Pelton wheel type, is set horizontally, the wheel being indicated at C. The buckets are so shaped and attached to the wheel that the water issuing from the nozzle extension indicated at *f* and through the narrow opening or slot *f'* will enter at the top of the buckets and after passing over their curved faces, leave them at the bottom. These specially formed buckets are indicated at I, I, and are diagrammatically shown in operative position with regard to the slot *f'* in Fig. 10. In the construction shown in Fig. 8 the size of the jet is regulated by a shutter or swinging gate J which is a well known device for regulating flow and takes the place of nozzle E in Fig. 2.

It will be obvious for the reason that my construction provides for the impact of the narrow high velocity jet upon any desired number of buckets attached to the wheel that it is practical for me to make a wheel with a smaller number of buckets than in the usual construction for the given power and also that I am enabled to use a wheel of smaller diameter and revolve it with higher speed which is of manifest advantage esspecially where this turbine is to be used for generating electric power and where the wheel and the generator are mounted on the same shaft. A very notable advantage of my construction is that when the wheel is to be used under a partial load the size of the jet is cut down proportionately. In this case, as indicated for instance in Fig. 8, the high velocity jet does not come in contact with the first buckets registering with the opening of the nozzle extension but owing to the contraction of the nozzle extension the jet does come in contact with the final buckets and always impinges upon them at the proper angle and with full velocity, acting, therefore, with high efficiency on a smaller number of buckets.

I have heretofore referred to that portion of the concave jet reversing buckets against which the jet first impinges as the jet receiving edges of the buckets, and in my claims I use the term "jet receiving edge" as defining not the mathematical edge of the bucket but that portion ofthe concave bucket adjacent to the mathematical edge against which the jet first impinges.

Having now described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. In combination with a turbine wheel having jet reversing buckets extending radially from the wheel with their jet receiving edges located so as to be approximately tangential to the plane of the impelling jet, means for converting the pressure of a fluid into velocity, a nozzle extension for receiving and guiding the fluid from said means extending around the wheel with gradually contracting area and having a narrow slot like opening registering with the tangential jet receiving edges of the buckets and through which opening the nozzle extension delivers high velocity fluid tangentially into the buckets.

2. In combination with a turbine wheel having jet reversing buckets extending radially from the wheel with their jet receiving edges located so as to be approximately tangential to the plane of the impelling jet, said buckets extending alternately in opposite directions and having their tangential jet receiving edges located to register with the narrow slot like opening from the nozzle extension, means for converting the pressure of a fluid into velocity, a nozzle extension for receiving and guiding the fluid from said means extending around the wheel with gradually contracting area and having a narrow slot like opening registering with the tangential jet receiving edges of the buckets and through which opening the nozzle extension delivers high velocity fluid tangentially into the buckets.

GUSTAV B. PETSCHE.