C. DE G. PROFFITT.

TURBINE.

APPLICATION FILED NOV. 20, 1912.

1,066,946.

Patented July 8, 1913.

2 SHEETS—SHEET 1.

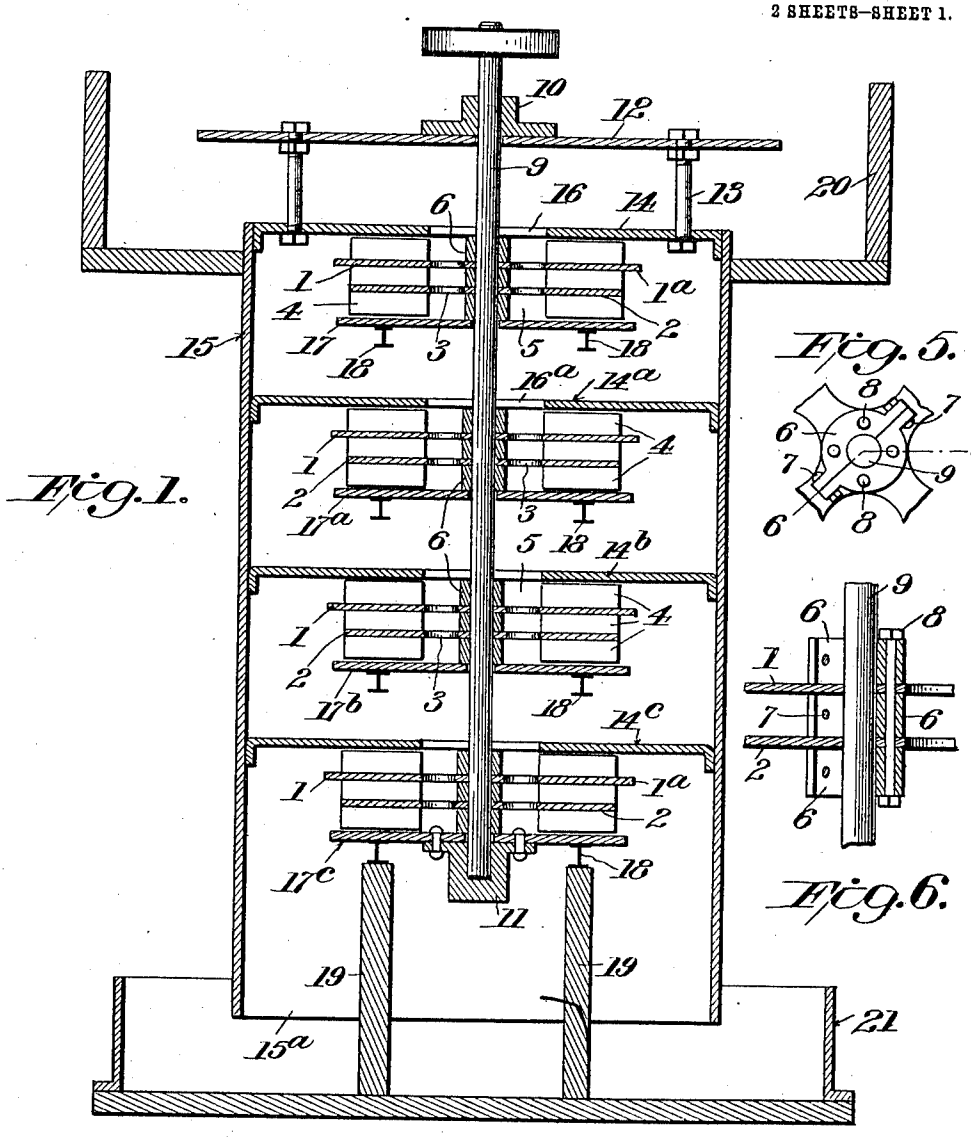


Fig. 1.

Fig. 5.

Fig. 6.

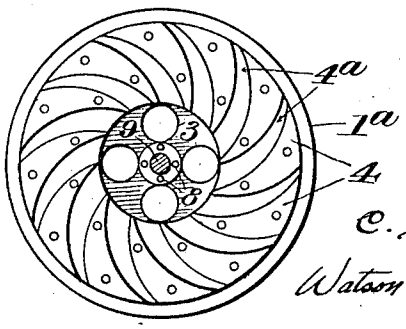


Fig. 3.

WITNESSES

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2 SHEETS—SHEET 2.

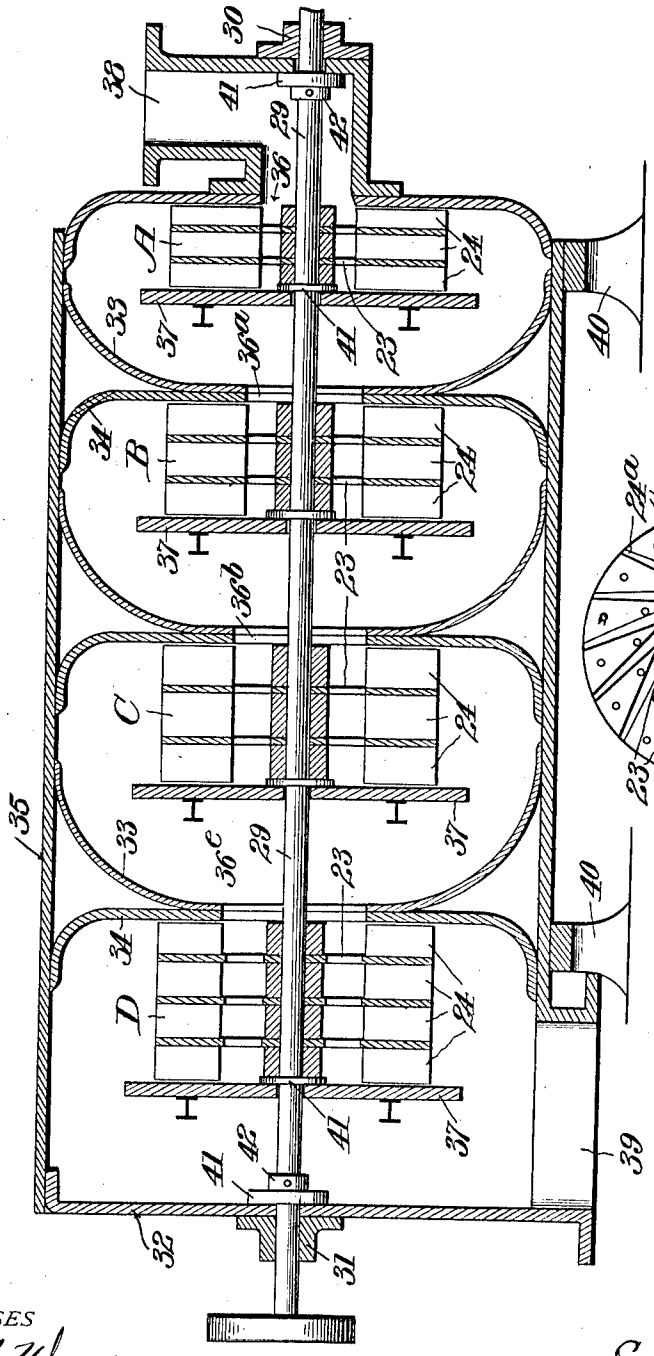


FIG. 2.

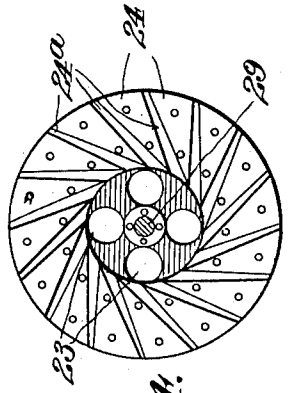


FIG. 4.

WITNESSES

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TURBINE.

1,066,946. Specification of Letters Patent. Patented July 8, 1913.

Application filed November 20, 1912. Serial No. 732,498.

To all whom it may concern:

Be it known that I, CHASTAIN DE GRASSE PROFFITT, a citizen of the United States, residing at Richmond, in the county of Henrico and State of Virginia, have invented certain new and useful Improvements in Fluid-Turbines, of which the following is a specification.

My invention relates to fluid motors and more particularly to motors of the turbine type, adapted for use with either water or steam.

One of the main objects of the invention is to provide an efficient radial flow wheel so constructed that the pressures on opposite sides thereof will be balanced so as to take the thrust off of the bearings.

Other objects will appear from the following description.

In order that the invention may be readily understood, reference is had to the accompanying drawings, in which,

Figure 1 is a conventional central, vertical section through my improved motor as constructed for use with water; Fig. 2 is a similar view of an arrangement adapted for use with steam; Fig. 3 is a plan view of one of the wheels which I employ; Fig. 4 is a similar view of a modified construction of wheel; Fig. 5 is a detailed plan of the hub construction; and, Fig. 6 is a section substantially on the line 6—6 of Fig. 5.

Referring to the drawings in detail, and particularly to Figs. 1, 3, 5, and 6, thereof, each of my improved wheels consists of one or more plates 1, 2, two of such plates being illustrated in Fig. 1, which plates form a body or support for the blades. The blades, as shown in Fig. 3, are formed of blocks of any suitable material and are designated by the reference character 4. As shown in Fig. 3, the blades are curved in form and are so shaped as to lie slightly closer together on their outer periphery than at the end nearer the center, thus forming curved tapering fluid passages 4^a having their outer ends somewhat reduced in size and so disposed as to discharge streams of fluid in a substantially tangential direction. The type of wheel shown in Fig. 3 may be employed either with steam or water as a motive power. One or more (two being shown) of the plates, such as 1, are secured to the shaft by means of split hubs 6, secured together by bolts 7, as clearly shown in Fig. 5. One of these hub sections is arranged on each side of each plate and bolts 8 pass through all of said hub sections and plates and bind them securely together. (See Fig. 6.) The blades 4 do not extend all the way to the center of the wheel, but are spaced therefrom to provide a central chamber 5, each plate having a plurality of openings 3 between the blades and the hub serving to establish communication between all of said chambers. In practice, I preferably employ a series of wheels upon the same shaft. As shown in Fig. 1, these wheels may be secured to a vertically arranged shaft 9, mounted in bearings 10 and 11. The bearing 10 may be carried by a top plate 12, supported in any suitable manner, as by means of bolts 13 upon the upper end of the wheel casing 14, which in reality constitutes a portion of the draft tube 15. The plate 14 is cut away at its center to provide an intake opening 16, such opening lying immediately above and being substantially of the same diameter as chambers 5. Underneath each wheel is arranged a bottom plate 17, 17^a, etc., suitably supported as by means of I-beams 18. The whole system may be supported by suitable columns 19. 20 designates the forebay for supplying water to the wheels and 21 indicates a wall surrounding and extending above the lower edge 15^a of the draft tube 15 so as to provide a water seal therefor. Water entering the wheel casing at the intake opening 16 flows radially outward between the first set of blades carried by the upper surface of the plate 1. Part of the water passes downwardly through the openings 3 in such plate and thence radially outward between the vanes located between the two plates. Part of the water also passes downwardly through the openings 3 in the second plate and thence radially outward through the lower set of vanes. It will be noted that the top and bottom faces of the wheel are smooth and flat and work closely between the plates 14 and 17, and it will be seen that the water pressure between the plate 2 and the plate 17 will counteract the pressure between the plate 1 and the plate 14 and thus, as it were, cause the wheel to "float" between the two plates 14 and 17, the weight of the water producing substantially no end thrust. From the first wheel the water passes downwardly through the openings 16^a in the top plate 14^a of the next wheel chamber and thence through the next wheel in the manner described above, pro-

ducing the same effect. Thus, the water passes in succession through the series of wheels until it finally escapes from the lower end of the draft tube. It will thus be seen that the bearing 11 is not subjected to any thrust or strain due to the weight of a column of water, since in each wheel the pressures are balanced or equalized in both directions. Only a single plate, such as 1, with vanes on each side thereof, may be employed, if desired, and will produce the same balanced effect, the essential feature being the arrangement of the wheel between two fixed plates. In the larger sizes it may be necessary in practice to extend the edge of one of the plates, such as 1, beyond the vanes, as indicated at 1^a, so that fixed guide brackets (not shown) may be applied to such projecting edge for the purpose of steadying the wheel and giving the necessary rigidity thereto.

In Fig. 4, I have shown a slightly modified form of wheel in which the vanes are composed of blocks 24, with straight, narrow fluid passages 24^a therebetween, such passages being slightly smaller at the periphery of the wheel than at the end nearer the center. The purpose of making the fluid passages smaller at the outer than at the inner ends as above described, and as shown in Figs. 3 and 4, is to insure the fluid issuing from the periphery of the wheel at high velocity. There will necessarily be a slight leakage between the blades and the plates, such as 14 and 17, and the tapering form of fluid passage is designed to compensate for such leakage. In other words, the intake end of the passages being larger than the discharge end, such discharge end will run always full, notwithstanding slight leakage.

In Fig. 2, I have illustrated my improved wheel as embodied in a steam turbine. A series of wheels, A, B, C, and D, are preferably mounted upon a shaft 29 journaled in bearings 30 and 31, the latter being carried by the end wall 32 of the casing 35. The casing is preferably divided into a plurality of wheel chambers by means of transverse partition plates 33 and 34, arranged as shown. Each wheel works between a partition plate 34 and an auxiliary plate 37, corresponding in operation and function with the plate 17 of Fig. 1. Steam enters the casing through an intake opening 38 and passes thence through a throat 36 into and through the first wheel A, the pressure on opposite sides of such wheel being equalized in the manner above described. The steam then passes through the opening 36^a into and through the wheel B and thence through wheels C and D in succession, whence it finally escapes through the exhaust opening 39. The casing may be supported on suitable pedestals 40. It will be noted that the wheels A, B, C, and D, increase progressively in thickness and that the openings 36 36^a, etc., and 23, become progressively larger so as to allow for the expansion of the steam. The wheel D is shown as consisting of four sets of blades instead of three, and it may be expedient to increase the number even beyond this in certain cases. In order to prevent the escape of steam through the openings in the plates through which the shaft passes, I preferably mount on said shaft adjacent each of such openings, a ring or collar 41. In the case of the plates 37, the pressure holds such rings in position while the end rings, adjacent the bearings, may be secured by means of fixed collars 42.

It will be understood that either of the wheels shown in Fig. 3 or Fig. 4 may be employed with either steam or water, as experience may indicate.

What I claim is:

1. A turbine wheel comprising a circular plate and a plurality of continuous substantially radially disposed vanes disposed on each side thereof, said plate being cut away adjacent its center to provide openings, each vane extending from such cutaway portion to the periphery of the wheel.

2. A turbine wheel having substantially radially disposed vanes on each side thereof extending from near the center to the periphery of the wheel, each vane extending from near the center to the periphery of the wheel, the side edges of said vanes all lying in the same plane, and a pair of flat, smooth plates between which said wheel is mounted for rotation and with which the said edges of said vanes are in substantial engagement.

3. A radial flow turbine wheel having continuous, uninterrupted, radial fluid passages on each side face thereof, and a pair of plates between which said wheel is adapted to rotate, such plates constituting one wall of said fluid passages.

4. A radial flow turbine wheel having continuous, uninterrupted, radially extending fluid passages on each side face thereof from near the center to the periphery of the wheel, a pair of plates between which said wheel is adapted to rotate, such plates constituting one wall of said passages, and means for supplying fluid simultaneously to the passages on each side of said wheel whereby the fluid pressures on said wheel are equalized.

5. The combination with a pair of fixed plates spaced apart, of a turbine wheel mounted for rotation between said plates and provided on each face with radially disposed fluid passages extending from a point near the center to the periphery of the wheel, one of said plates being cut away at its center to provide an intake opening for supplying fluid to one side of said wheel, and said wheel itself being cut away at

points opposite said intake opening to provide a passageway for supplying fluid to the other side of said wheel.

6. A radial flow turbine wheel having fluid passages on each side face thereof, such passages being smaller at their outer than at their inner ends and tapering uniformly throughout their length, and a pair of plates between which said wheel is adapted to rotate, such plates constituting one wall of said fluid passages.

In testimony whereof I have affixed my signature, in presence of two witnesses.

CHASTAIN DE GRASSE PROFFITT.

Witnesses:
D. J. ELVERY,
HATTIE VENISKEY.

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