

C. A. SCHELLENS.
ELASTIC FLUID TURBINE.
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1,263,473.

Patented Apr. 23, 1918.

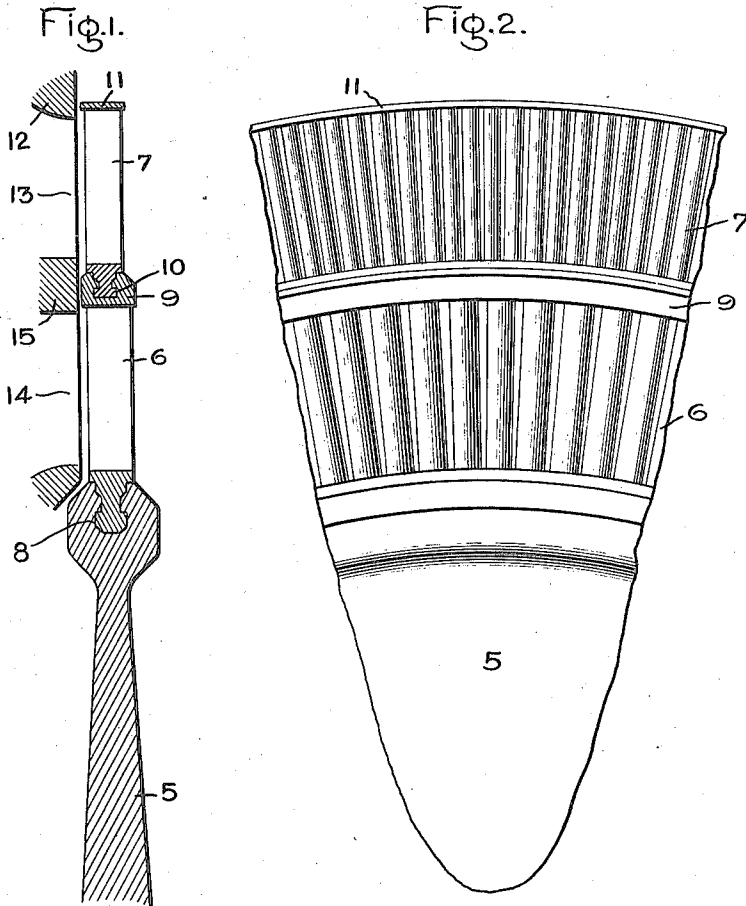
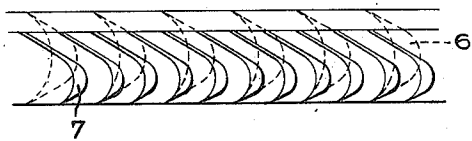


Fig. 3.



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UNITED STATES PATENT OFFICE.

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ELASTIC-FLUID TURBINE.

1,263,473.

Specification of Letters Patent.

Patented Apr. 23, 1918.

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To all whom it may concern:

Be it known that I, CHRISTOPHER A. SCHELLENS, a citizen of the United States, residing at Clifton, county of Essex, State of Massachusetts, have invented certain new and useful Improvements in Elastic-Fluid Turbines, of which the following is a specification.

In the construction of elastic fluid turbines, particularly the larger sizes, the bucket heights in the last stages become very high relative to the pitch diameter of the wheels due to the high specific power met with in such stages. The effect of this is first to make the spacing of the buckets large at their outer ends and small at their roots, and second to make the linear velocity of the buckets much greater at their outer ends than at their roots. The effect of this is to decrease the efficiency of such wheels, since for any particular elastic fluid pressure and velocity there is a corresponding bucket spacing and wheel velocity which gives the highest efficiency. If, therefore, the buckets are correctly spaced and have the desired velocity at their central portions, for example, then they are too close together and do not have sufficient velocity at their roots and are spaced too far apart and have too great a velocity at their outer ends.

The object of the present invention is to remedy these defects to a great extent and to provide a bucket wheel and turbine structure which will give a better efficiency than heretofore. To this end I provide a bucket wheel having two or more concentric rings or blades, the outer ring or rings being reaction buckets or blades and the inner ring or rings being reaction buckets or blades having a lesser degree of reaction than the outer ring or rings or even being impulse buckets or blades. In this connection it is pointed out that it is well-known that a reaction blading may be constructed with various degrees of reaction in the moving guides or blade rings. The greater the amount of reaction, the greater is the pressure drop in such moving guides or rings and the greater the necessary peripheral speed for a given pressure drop through the stationary and moving guides or blade rings. As this reaction in the moving blade rings approaches zero, such blade rings approach impulse blades. In other words the impulse

blade in which the pressure drop through the blade is zero, is the limiting case of a reaction blade. It may be stated that the greater the degree of reaction the higher the peripheral speed required to efficiently extract the energy from the elastic fluid.

By this improved arrangement the first difficulty as to the spacing of the blades can, to a great extent, be overcome as each ring of blades may be spaced separately; and the second difficulty is to a great extent overcome since the blading having the greatest degree of reaction will have the greatest speed, which as pointed out above is the desired arrangement.

In the drawing which illustrates my invention, Figure 1 is a sectional view of a part of a turbine rotor and the adjacent cooperating stationary member; Fig. 2 is a side elevation of a portion of a ring of blading; and Fig. 3 is a top plan view of Fig. 2 with the outer bucket cover omitted.

Referring to the drawing 5 indicates a turbine rotor, here shown in the form of a wheel. On its periphery is mounted a blading comprising two concentric rings or blades, the inner one 6 being blading having one degree of reaction and the outer one 7 being blading having a greater degree of reaction. In the first instance the blading may have zero reaction and hence the impulse blading. They may be joined together in any suitable manner. In the present instance the blades 6 are fastened in a slot 8 in the rim of the rotor in a well-known manner, and they are provided with a cover 9 in which is cut a slot 10 for the reception of the bases of the ring of blades 7. The ring of blades 7 may be provided with a suitable cover, as indicated at 11. 12 indicates the cooperating stationary member for the blade rings shown. It has a set of directing vanes or nozzles 13 for the ring of blades 7, and a second set 14 for the ring of blades 6. They are separated by a suitable partition 15 in line with the blade cover 9. Between adjacent stationary and moving parts, as between members 11 and 12, there is a very small clearance to prevent leakage as much as possible. This may be an axial clearance as shown or a radial one, whichever suits the particular form of construction best; also close clearances or suitable packing arrangements may be uti-

lized at other points to prevent leakage as found desirable.

The two rings of blading 6 and 7 are separately assembled, and, as is clear from an inspection of Figs. 2 and 3, the blades 6 are spaced in the most advantageous manner as are also the blades 7. It will also be clear that the blading 7 will have a greater peripheral speed than the blading 6 which is the desired arrangement, as already explained.

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 as new and desire to secure by Letters Patent of the United States, is—

1. A turbine rotor having a blading thereon comprising two concentric blade rings the

radially inner one having a lesser degree of reaction than the outer one.

2. A turbine rotor having a blading thereon comprising two concentric blade rings, the radially inner one being made up of impulse blades, and the radially outer one of reaction blades.

3. In an elastic fluid turbine, the combination of a rotor, a ring of impulse blading thereon, a cover for such blading, a ring of reaction blading carried by said cover, and means for supplying elastic fluid to said rings of bladings.

4. In an elastic fluid turbine, the combination of a rotor, a ring of reaction blading thereon, a cover for such blading, a ring of reaction blading carried by said cover having a higher degree of reaction than the first ring, and means for supplying elastic fluid to said rings of bladings.

In witness whereof, I have hereunto set my hand this 17th day of September, 1917.

CHRISTOPHER A. SCHELLENS.