G. McINTOSH.

TURBINE.

APPLICATION FILED JUNE 29, 1908.

920,489. Patented May 4, 1909.

Fig. 1.

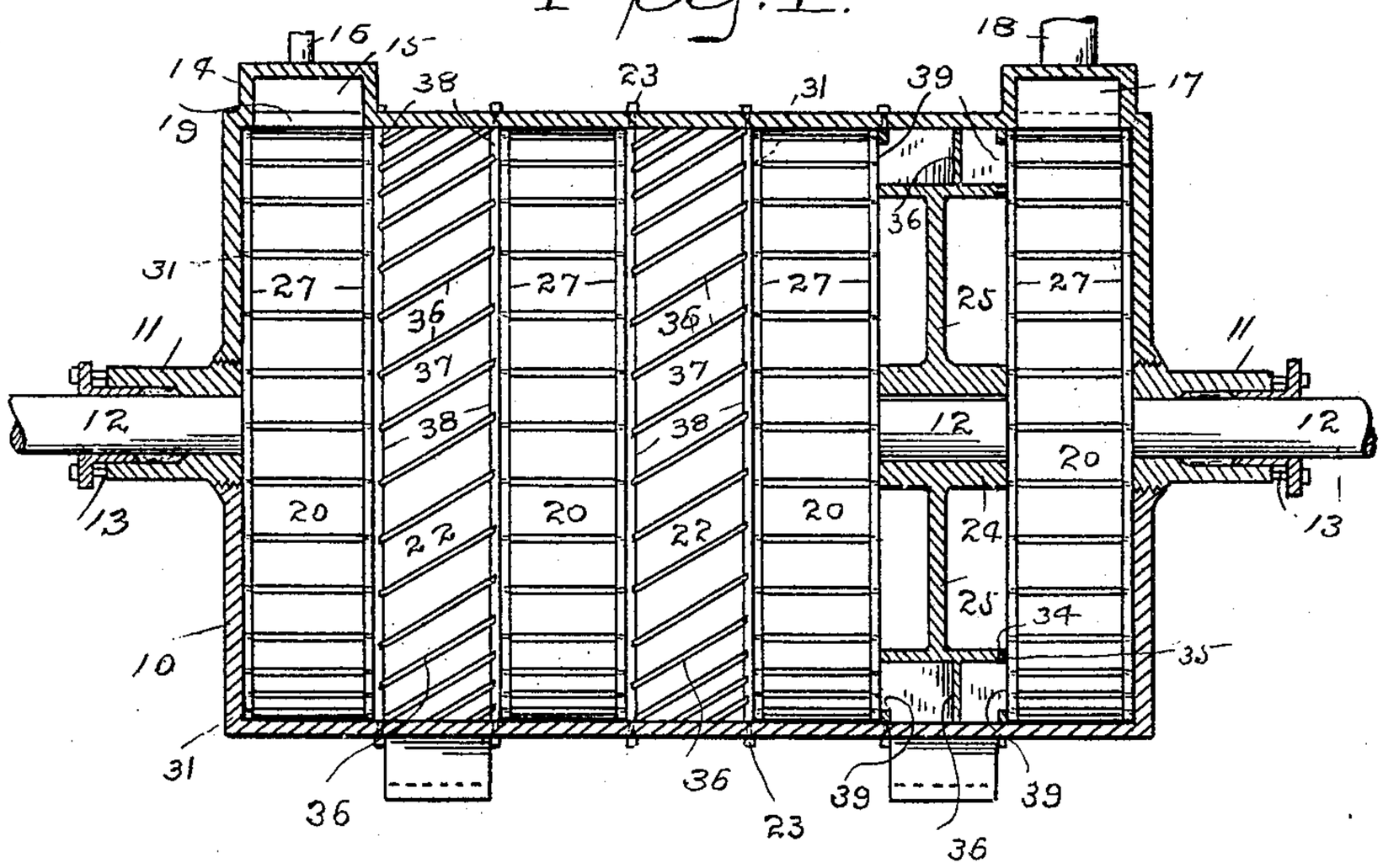
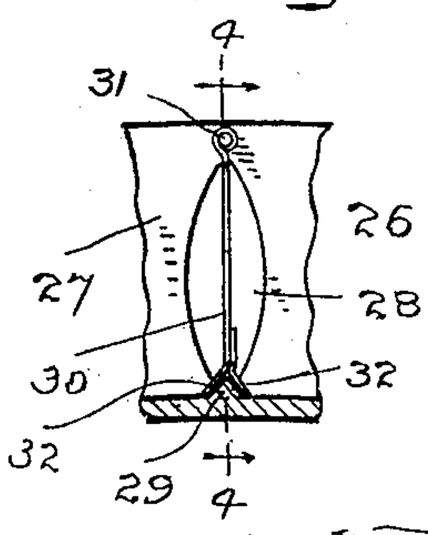


Fig. 2.

Fig. 3.



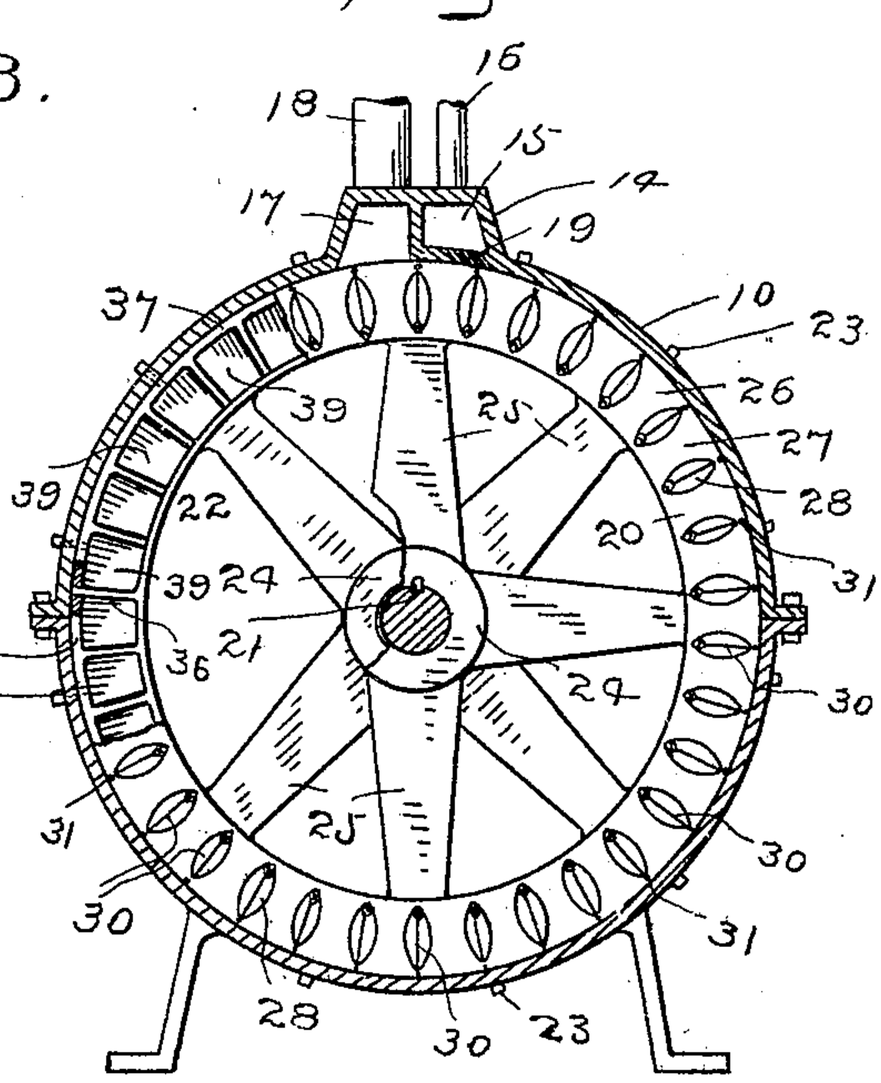


Fig. 4.

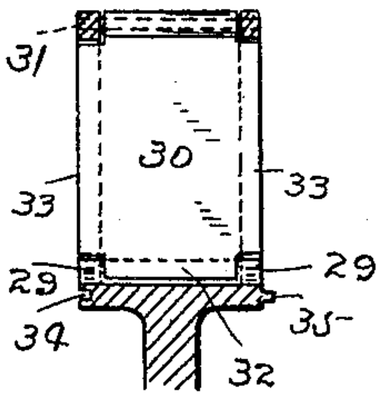
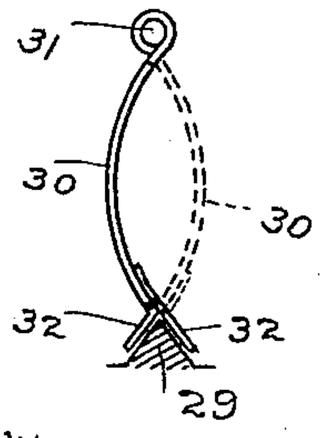


Fig. 5.



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TURBINE.

No. 920,489. Specification of Letters Patent. Patented May 4, 1909.

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To all whom it may concern:

Be it known that I, GEORGE McINTOSH, a citizen of the United States, residing at Stonington, county of New London, State of Connecticut, have invented a new and useful Turbine-Engine, of which the following is a specification.

This invention relates to turbine engines adapted for general use and with any operating fluid, as for example, steam, gas or water, and the invention has for its objects to provide a reversing turbine in which the cost of construction shall be greatly reduced, the number of parts being reduced to the minimum, and in which the cost of running shall be greatly reduced for the reason that instead of a continuous flow of the operating fluid there is a continuous succession of cut-offs.

With these and other objects in view I have devised the novel turbine which I will now describe, referring to the accompanying drawing forming a part of this specification and using reference characters to indicate the several parts.

Figure 1 is a longitudinal section of my novel turbine, rotors and guide wheels being shown in elevation; Fig. 2 a transverse section, the rotor being partly broken away to show the guide wheel beyond it; Fig. 3 a detail view on an enlarged scale, showing the base of the rim of a rotor in longitudinal section and a side plate and blade in elevation; Fig. 4 a vertical section on the line 4—4 in Fig. 3, looking in the direction of the arrows; and Fig. 5 is a detail view on a still larger scale, illustrating the operation of a flexible blade when acted on by the operating fluid.

For convenience in description we will suppose the operating fluid to be steam, although the structure is equally adapted to be driven by any other operating fluid.

10 denotes a cylindrical casing shown as made in two sections bolted together and having at its ends hubs 11 shown as made separate from the heads of the casing and detachably secured thereto. The shaft 12 extends through the casing and the hubs, each of which is shown as provided with a stuffing box indicated by 13. One section of the casing is shown as provided at each end with a steam chest 14, each steam chest being divided longitudinally into a receiving chamber 15 into which a steam pipe 16 leads and an exhaust chamber 17 from which an exhaust pipe 18 leads. The inner wall of the receiving chamber is provided with a plurality of ports 19 (three in the present instance) which are preferably placed at an angle and lead into one of the rotors in the casing. The exhaust chambers have no inner walls and are open into the casing.

20 denotes rotors, a plurality of which are rigidly secured to the shaft as by keys 21. Intermediate the rotors are guide wheels 22 through which the shaft passes freely and which are rigidly secured to the casing as by screws 23. The guide wheels are placed intermediate the rotors, a rotor being placed at each end of the casing. In the present instance I have shown a turbine comprising four rotors and three guide wheels. The construction of the rotors and guide wheels will be readily understood from Figs. 1 and 2. The special construction of the bodies of the rotors and guide wheels is unimportant so far as the present invention is concerned. I have shown the rotors as consisting of a hub 24, arms 25 and a rim 26 provided with side flanges 27. The side flanges are provided with elongated openings 28 whose sides are concave curves meeting at approximately a point at the inner and outer ends. The openings are in alinement in the opposite side flanges and the bases of the rims are provided with inverted V-shaped transverse ribs 29 in alinement with the inner ends of the openings. 30 denotes flexible blades pivoted, as on cross pins 31, between the outer edges of the side flanges and having at their lower ends wings 32 adapted to engage the opposite sides of the ribs. The opposite edges of the flexible blades are provided with extensions 33 which are adapted to engage the opposite walls of the elongated openings and form tight joints to prevent the escape of steam or other operating fluid. The rim of each rotor and guide wheel is provided in one edge with a circular groove 34 and on the other edge with a circular rib 35, said ribs and grooves being interengag-

ing to prevent escape of steam or other operating fluid.

The guide wheels are shown as consisting of hubs 24 and arms 25, similar to the rotors, and rims 37 provided with side flanges 38 having transverse openings 39.

36 denotes the blades of the guide wheels, which are shown as rigidly secured in the side flanges between the openings. The construction of the guide wheels is wholly unimportant so far as the present invention is concerned. The blades may be thin strips of metal similar to the blades of the rotors, or the blades may be cast integral with the rims, arms and hubs. The blades of the guide wheels are shown as placed obliquely although that is not an essential feature of construction.

The operation is as follows: My novel turbine is reversible in the fullest sense; that is, it will drive the shaft in either direction with equal facility and speed. As already explained, there is a steam chest at each end of the casing and each steam chest is provided with a receiving chamber and an exhaust chamber. The steam, or other operating fluid, passes into the casing from one receiving chamber through ports 19, passes through the rotors and guide wheels successively and out through the exhaust chamber at the other end of the casing. To reverse, the steam is shut off at one end and admitted at the other end, the operation being precisely the same, the exhaust being, of course, from the opposite end of the casing to which steam is admitted. Suppose, for example, that steam enters the casing at the right, as seen in Fig. 1. It will pass to the first rotor at the right and will engage a plurality of the flexible blades simultaneously. The action of the steam will be to spring the blades, as indicated in Fig. 5, and cause the blades operated upon to curve from end to end and will force the extensions of the blades into engagement with the curved walls of the elongated openings. From the rotors the steam will pass through the elongated openings and between the blades of the contiguous guide wheels and from each guide wheel through the elongated openings in the next rotor and will spring the blades as before. The flexibility of the blades makes the engagement of the extensions with the walls of the elongated openings practically steam-tight, and the engagement of the circular ribs with the corresponding grooves prevents appreciable escape of steam between the rims.

It is an important feature of the present invention that the passage of steam from the rotors to the guide wheels is not continuous, but there is an instantaneous cut-off as each blade in a rotor passes a blade in a guide wheel. I thereby without impairing the operative force of the steam effect an important saving in the amount of steam that is consumed in driving the shaft.

Having thus described my invention I claim:

1. A turbine rotor having flexible blades yieldingly mounted at one margin, and supports for other margins of said blades.

2. A turbine rotor having flexible blades pivotally supported at one margin, and supports for the other margins of the blades.

3. A turbine rotor having flexible blades and curved supports for said blades.

4. A turbine having a circular series of flexible blades, and supports for said blades, said supports being spaced to permit the blades to yield in either one of two directions according to the direction of steam pressure.

5. A rotor for turbines comprising a rim provided with side flanges having elongated openings with curved sides, and flexible blades lying between the side flanges and having extensions adapted to be placed in engagement with the curved sides of the openings when acted upon by an operating fluid.

6. A rotor for turbines comprising a rim having side flanges provided with openings and flexible blades pivoted between the side flanges.

7. A rotor for turbines comprising a rim provided with side flanges, openings in said flanges and flexible blades lying between the flanges and having extensions engaging the openings.

8. A rotor for turbines comprising a rim having side flanges provided with openings, flexible blades lying between the flanges and cross pins on which the outer ends of the blades are pivoted.

9. A rotor for turbines comprising a rim having side flanges provided with openings and transverse ribs, and flexible blades pivoted between the side flanges and having wings engaging the opposite sides of the ribs.

10. A rotor for turbines comprising a rim provided with transverse ribs and side flanges having openings and flexible blades pivoted between the side flanges and having extensions engaging the openings and wings engaging the ribs.

11. A rotor for turbines comprising a rim provided with transverse ribs and side flanges having elongated openings with concave sides terminating approximately in points, and flexible blades pivoted between the side flanges and having extensions engaging the openings and wings engaging the ribs.

12. A turbine comprising a casing, a shaft, a plurality of rotors attached to the shaft, each rotor comprising a rim having side flanges with openings and flexible blades

pivoted between the flanges and having extensions engaging the openings, a plurality of guide wheels attached to the casing intermediate the rotors and means for supplying an operating fluid.

13. A turbine comprising alternate rotors and guide wheels, the rotors having rims with side flanges provided with openings and flexible blades pivoted between the flanges and having extensions engaging the openings, and the guide wheels being provided with blades, whereby the operating fluid is cut off each time a rotor blade passes a guide wheel blade.

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

GEORGE McINTOSH.

Witnesses:

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S. W. ATHERTON.