F. L. McCULLOCH.

REVERSIBLE STEAM TURBINE.

APPLICATION FILED DEC. 7, 1910.

1,016,080.

Patented Jan. 30, 1912.

2 SHEETS—SHEET 1.

Fig. 1

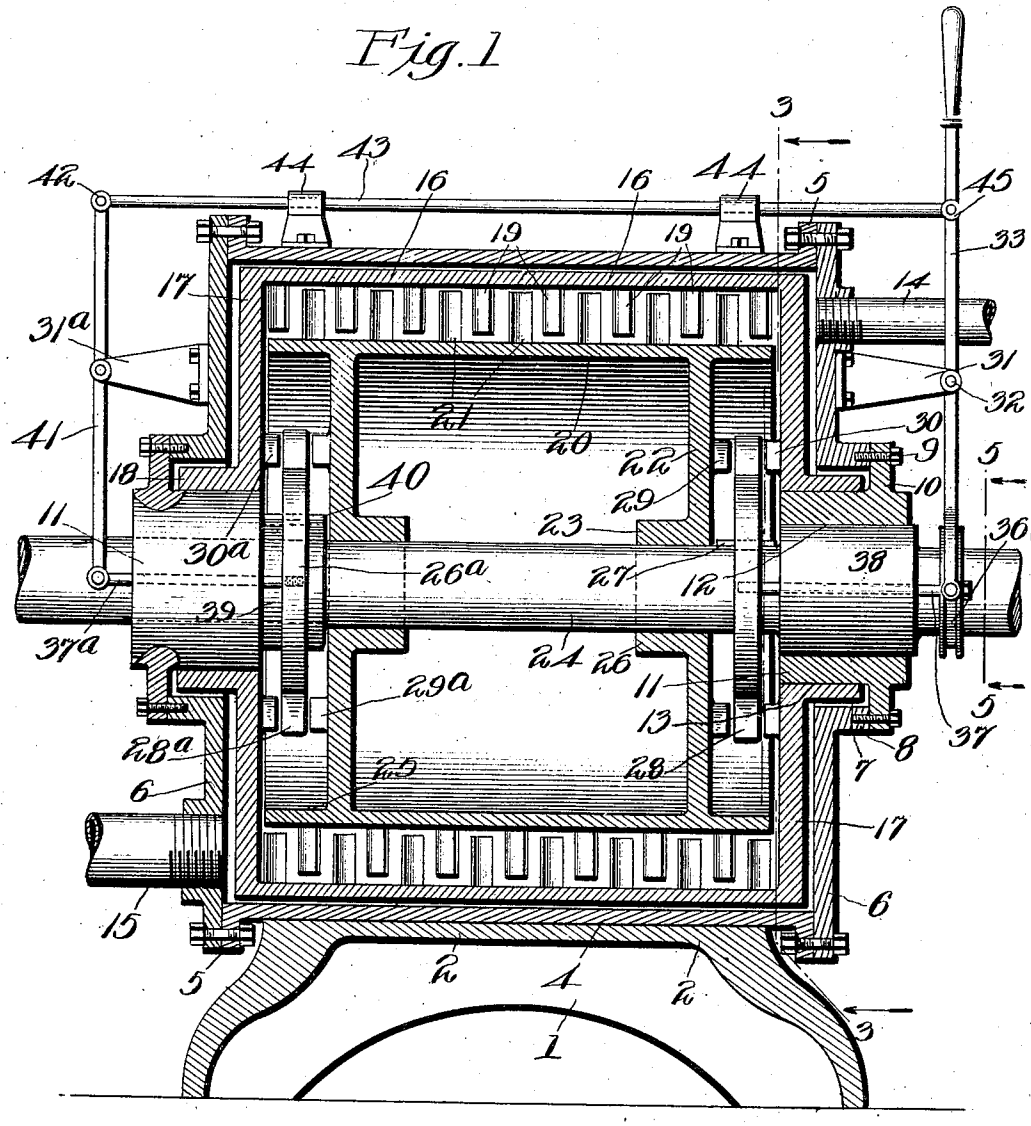
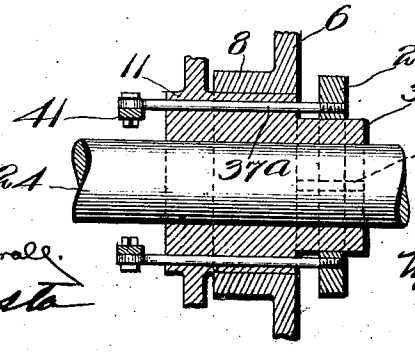


Fig. 2.



Witnesses

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2 SHEETS—SHEET 2.

Fig. 3.

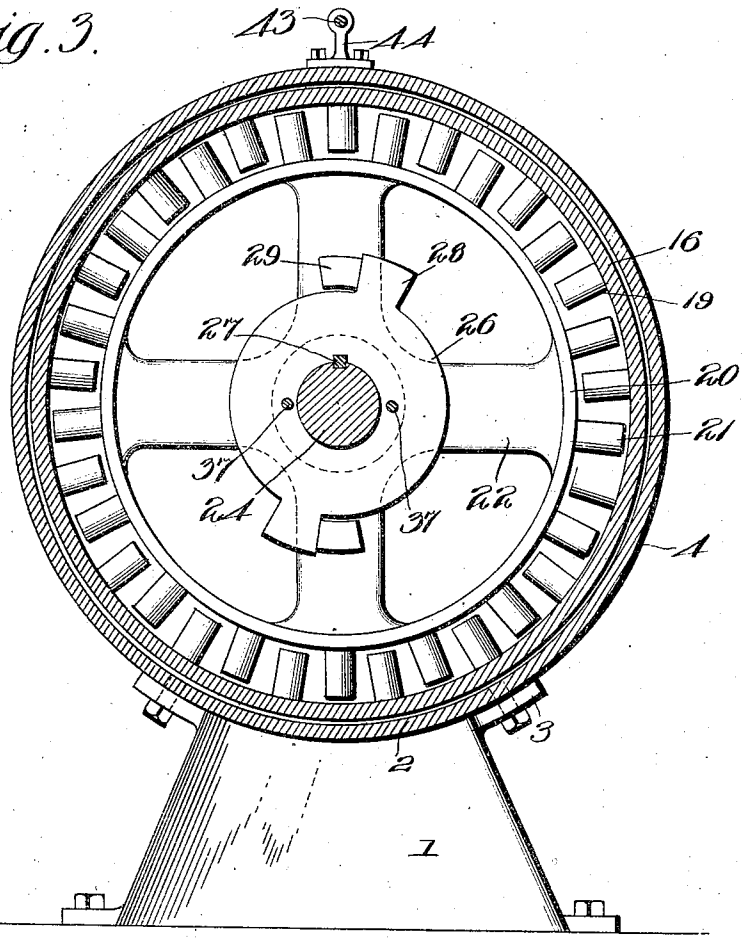


Fig. 4.

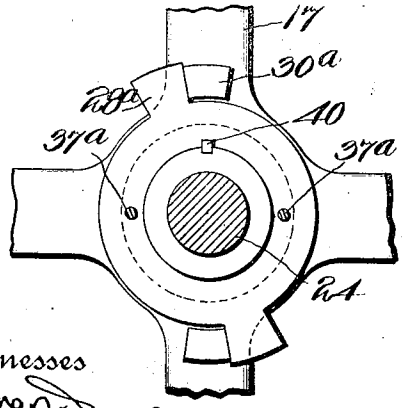
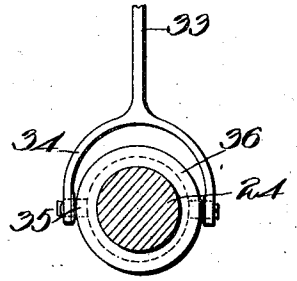


Fig. 5.



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UNITED STATES PATENT OFFICE.

FREDERICK L. McCULLOCH, OF ARCADIA, FLORIDA.

REVERSIBLE STEAM-TURBINE.

1,016,080. Specification of Letters Patent. Patented Jan. 30, 1912.

Application filed December 7, 1910. Serial No. 596,160.

To all whom it may concern:

Be it known that I, FREDERICK L. McCULLOCH, a citizen of the United States, residing at Arcadia, in the county of De Soto and State of Florida, have invented certain new and useful Improvements in Reversible Steam-Turbines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to improvements in fluid driven turbines, and while the invention is applicable for use with various operating fluids, for the purpose of simplicity of description, the following specification designates steam as the operating fluid.

The primary object of the invention is to produce a simple, compact, cheap and durable turbine, effective in operation and capable of being readily reversed.

Broadly, the invention consists of a plurality of revoluble members provided with oppositely arranged impelling surfaces against which the steam impinges, in combination with means for locking one of said members against rotation and simultaneously interlocking another of said members with the driven shaft.

It will be understood that the invention is not restricted to the exact details shown and described, but to more clearly understand the same, reference is had to the accompanying drawings, in which like characters designate the same parts in the several views, and in which—

Figure 1 is a view in longitudinal vertical section; Fig. 2 is a fragmentary sectional view of the bearing at the left hand side of Fig. 1 and taken at right angles or in a horizontal plane; Fig. 3 is a cross sectional view on the line 3—3 of Fig. 1, and looking in the direction of the arrows; Fig. 4 is a fragmentary cross sectional view looking toward the inside face of the locking member at the left hand side of Fig. 1; and, Fig. 5 is a cross sectional view on the line 5—5 of Fig. 1, and looking in the direction of the arrows.

1 designates a base casting of any suitable form having a concave seat 2, at the top thereof and projecting curved plates 3 forming a continuation of said concave seat and supporting an annular stationary open ended casing 4 provided with annular flanges 5 to which are bolted the head plates 6 having central openings 7 formed by annular external projections 8 to which are bolted as at 9, an annular plate 10 supporting an inwardly projecting sleeve 11, having a central bore 12, and a cylindrical outer bearing surface 13, forming an inner and outer bearing member hereinafter referred to, the sleeve 11 having an exterior diameter less than the interior diameter of the annular projection 8 and disposed in the opening 7.

14 designates a steam inlet pipe at the top of the casing and 15 an exhaust pipe at the bottom of the casing suitably threaded in the head plates 6.

16 designates the peripheral wall of the outer cylinder having radial spoke members 17 at opposite sides provided with central annular projections 18 encircling the external bearing faces 13 of the sleeves 11, and rotatably supported thereby. The inner peripheral wall of the outer casing is provided with suitable impact surfaces tending to drive said cylinder to the left (Fig. 3) when not locked against rotation and upon introduction of steam into the cylinder. In the drawings, these impinging surfaces consist of the internal projecting vanes 19 of suitable angular disposition or curvature. The inner cylinder consists also of a peripheral wall 20 provided with suitable external impact surfaces illustrated by the vanes 21, alternating with the vanes 19 and so disposed as to tend to drive the inner cylinder in a reverse direction to the movement of the outer cylinder. This inner cylinder is also provided at opposite ends with radial spokes 22 terminating in the central internal bosses 23, revolubly mounted on the driven shaft 24 of the turbine. The peripheral wall of the inner cylinder projects outwardly beyond the spoke members as at 25 forming a chamber for interlocking mechanism between the cylinders and the stationary casing and between the cylinders and the driven shaft.

At the right hand side of the turbine, as shown in Figs. 1 and 3, 26 is an annular disk keyed to the shaft 24 by means of the key or feather 27 in such a way that the disk is locked against independent rotation with the shaft, but is free to slide longitudinally therealong. The peripheral edge of this disk is provided with one or more radial lugs 28, coöperating with outwardly projecting lugs 29 on the spokes 22 of the inner cylinder and with inwardly projecting lugs 30 on the spokes 17 of the outer cylinder.

31 designates a bracket secured to the casing head 6 and on this bracket is pivotally mounted as at 32 the operating lever 33, the upper end of which is provided with a handle and the lower end of which terminates in divided curved arms 34 provided with revolubly mounted inwardly projecting rollers 35 located in an annularly grooved member 36 mounted on said driving shaft to rotate therewith, but free to slide longitudinally thereof. This annularly grooved member 36 is provided with a pair of inwardly disposed rods 37 passing through apertures formed in the enlarged boss 38 on the driving shaft 24, which boss 38 is journaled in the casting 11, and the inner ends of the rod 37 are secured to the disk 26. At the opposite side, lugs 29^a, 30^a are located on the cylinders similar to the lugs previously described, but the disk 26^a is keyed to a cylindrical projection 39 integrally formed with the casting 11, being keyed thereon as at 40 and free to slide longitudinally thereof, but locked against rotation. This disk 26^a is connected by means of the rods 37^a with a lever 41 pivotally connected to the bracket 31^a and at its other end 42, pivoted to an operating rod 43 slidably mounted in the bearings 44 and connected at its other end as at 45 to the operating lever 33.

In operation and the parts being in the position shown in Fig. 1, it is evident that should steam be admitted through the pipe 14, the inner cylinder would rotate to the right and the outer cylinder to the left, the locking mechanism being in a neutral position. If it is desired to rotate the shaft 24 to the right, the handle of the operating lever is pulled to the right, which will force the lower end to the left shoving the disk 26 inwardly toward the spokes 22 into engagement with the lugs 29 in the position shown in Fig. 3. At the same time, by means of the leverage connections, the disk 26^a is forced away from the inner cylinder and engages behind the lugs 30^a of the outer cylinder. The disk 26^a being locked against rotation, it is evident that the outer cylinder will now be locked against rotation, but the disk 26 being keyed to the shaft 24 the inner cylinder being interlocked with the disk 26, will drive the latter and the shaft 24 to the right. To reverse the engine, the handle of the operating lever is moved to the left, which will draw the disk 26 into interlocked engagement with the outer cylinder at the right hand side, and will move the non-rotatable disk 26^a into interlocked engagement with the inner cylinder at the left hand side of the turbine, whereby the inner cylinder is held against rotation while the outer cylinder through the disk 26 will rotate the shaft in the reverse direction to that just described.

While not illustrated on the drawings, it will be obvious that suitable stuffing boxes or packing rings may be provided to prevent leakage.

Other minor details of construction might suggest themselves to those skilled in the art, and having thus described a practical and preferred embodiment of the invention, the particular features of novelty will now be pointed out more succinctly in the following claims.

I claim—

1. In a fluid driven turbine, the combination of a plurality of rotatably mounted members, one mounted within the other and provided with oppositely arranged impelling surfaces adapted to receive the impact from a fluid supply, a driven shaft, interlocking means carried by the adjacent ends of said rotatable members and said driven shaft, and means operating said interlocking means to hold one of said members against rotation and simultaneously locking another of said members to said shaft, substantially as described.

2. In a fluid driven turbine, the combination of a plurality of cylinders provided with oppositely arranged impelling surfaces, a driven shaft, locking lugs carried by said cylinders, a locking member keyed to said shaft but free to move longitudinally thereof and having locking lugs coöperating with one set of lugs on said cylinders, a second locking member keyed against rotary movement but free to slide longitudinally and provided with locking lugs coöperating with another set of locking lugs on said cylinders, and means for simultaneously shifting said locking members, substantially as described.

3. In a fluid driven turbine, the combination of a plurality of rotatably mounted cylinders, one mounted within the other and provided with oppositely disposed inner and outer alternating vanes adapted to receive the impact from the impelling fluid, a driven shaft, and means arranged between the ends of the cylinders for locking one of said cylinders against rotation and interlocking another of said cylinders with said shaft, substantially as described.

4. In a fluid driven turbine, the combination of a plurality of rotatably mounted cylinders one within another and provided with inner and outer oppositely arranged alternating radial vanes adapted to receive the impact from the impelling fluid, the inner cylinder being provided with outwardly projecting lugs at its ends and the outer cylinder being provided with inwardly projecting lugs at its ends, a driven shaft supporting said cylinders, a locking member keyed to said shaft and slidably mounted thereon between the lugs at one end of said cylinders, a second locking member slidably mounted but locked against rotation

disposed between the lugs at the opposite ends of said cylinders, and means for simultaneously shifting said locking members, substantially as described.

5. In a fluid driven turbine, the combination of a stationary annular casing, a driving shaft extending therethrough, a rotatably supported outer cylinder within said casing, a rotatably supported inner cylinder within said outer cylinder, said cylinders being provided with oppositely arranged impelling surfaces and the outer and inner end faces of said inner and outer cylinders being provided with oppositely disposed projecting lugs, a locking member having radial lugs coöperating with one set of said cylinder lugs, said locking member being keyed to rotate the said shaft while slidable thereon, a second locking member provided with radial lugs coöperating with the set of cylinder lugs at the opposite end of the turbine, said second locking member being fixed against rotation but slidable longitudinally of said shaft, and leverage connections for simultaneously operating said locking members in the same direction, substantially as described.

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

FREDERICK L. McCULLOCH.

Witnesses:
R. A. TURNER,
HARLEY WATSON.