L. S. FLATAU.

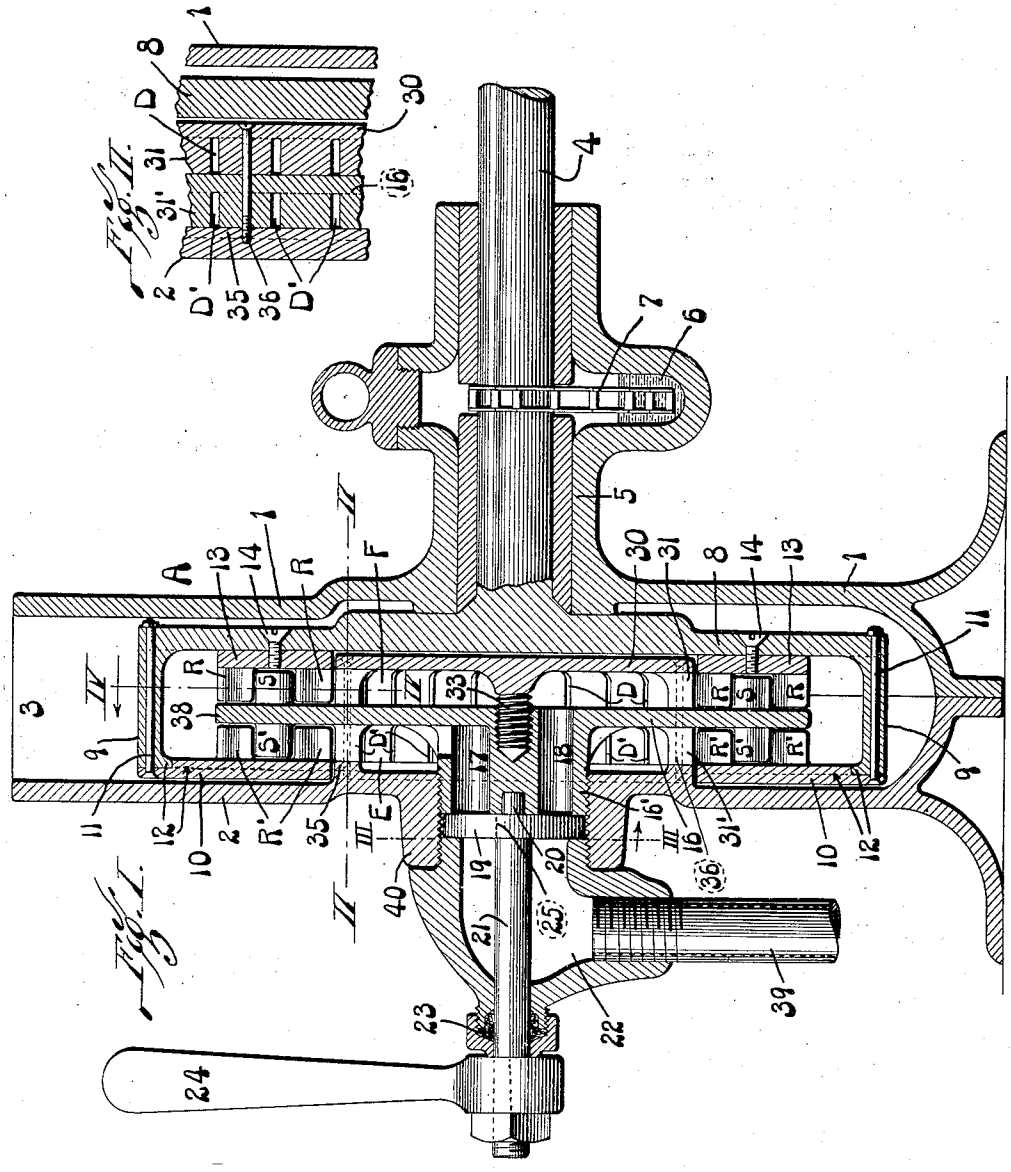
TURBINE.

APPLICATION FILED FEB. 23, 1915.

1,159,754.

Patented Nov. 9, 1915.

2 SHEETS—SHEET 1.



Attest:
E. M. Warrington
A. J. McCauley

Inventor:
L. S. Flatau
By Knight & Cook Attys.

COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

L. S. FLATAU.

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2 SHEETS—SHEET 2.

Fig. III.

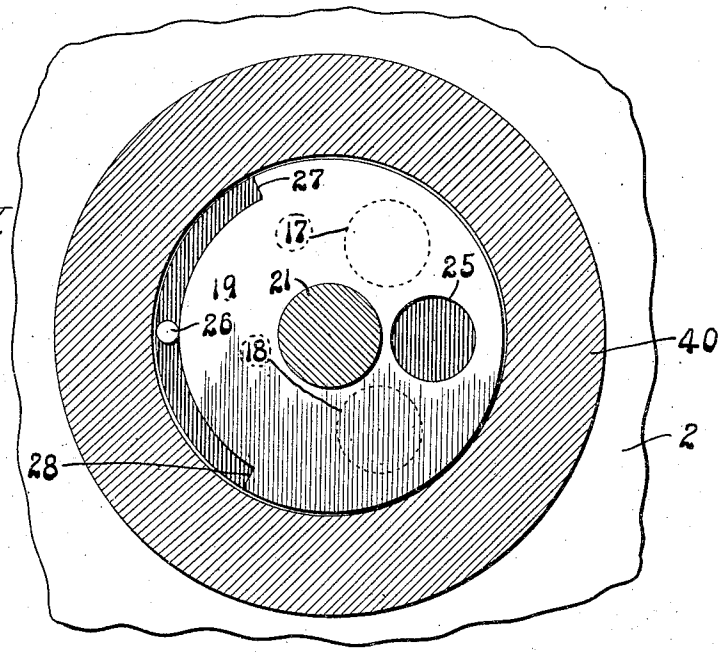
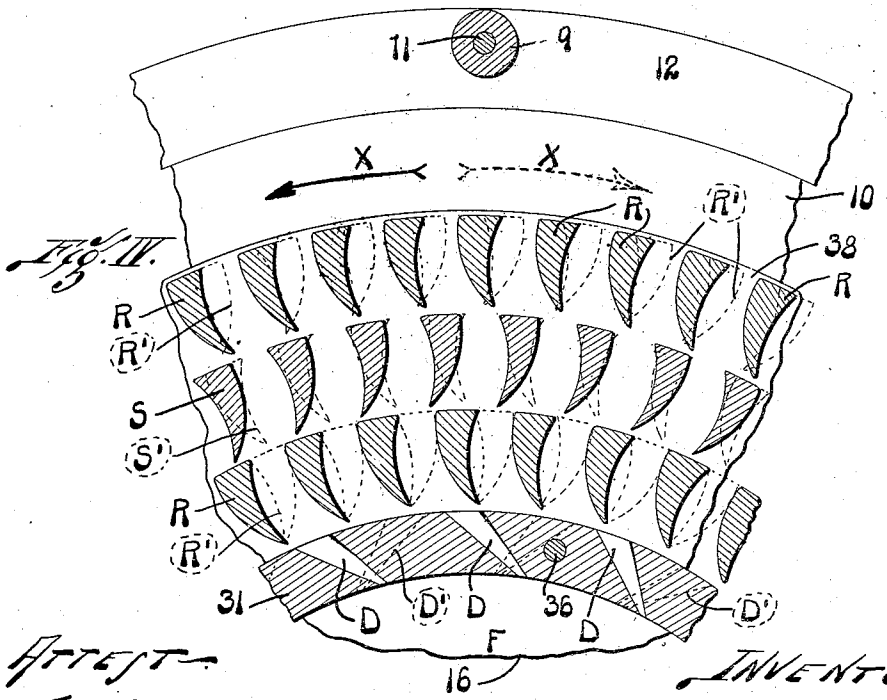


Fig. IV.



Attest—

E. M. Warrington.

A. J. McCauley

Inventor—

L. S. Flatau

By Knight & Cook Attys.

UNITED STATES PATENT OFFICE.

LOUIS S. FLATAU, OF ST. LOUIS, MISSOURI.

TURBINE.

1,159,754. Specification of Letters Patent. Patented Nov. 9, 1915.

Application filed February 23, 1915. Serial No. 9,899.

To all whom it may concern:

Be it known that I, LOUIS S. FLATAU, a citizen of the United States of America, a resident of the city of St. Louis, State of Missouri, have invented certain new and useful Improvements in Turbines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to a turbine engine of the type shown in Patent No. 1,099,792, issued to me June 9, 1914, some features of the present invention being improvements on the structure shown in said patent.

One of the objects of this invention is to produce a reversible turbine engine having rotatable elements, all of which are supported by a bearing or bearings at only one side of the engine housing. The reversible engine shown in the above mentioned patent includes two sets of rotatable vanes, two shafts secured to said rotatable vanes and fitted to bearings at opposite sides of the casing, one of the shafts being a tubular member. The fluid, usually steam, passes through this tubular shaft member. In accordance with the present invention, the steam is admitted at one side of the housing, and the rotatable elements are supported by a bearing at the opposite side of the housing, the object being to produce a reversible engine of the type referred to, having its bearings located remote from the fluid conductors where they will not be affected by the heat of the live steam.

Another object is to improve the means for controlling the admission of fluid to the different sets of vanes.

A further object of the invention is to produce a turbine engine having discharge ports from which fluid is primarily discharged onto the vanes in the form of wide streams, instead of tubular jets which spread after striking the first set of vanes. These discharge ports are preferably long narrow slots, approximately equal in length to the vanes, so that the discharged fluid will immediately impinge against the broad faces of the vanes, instead of wasting a portion of its energy by spreading laterally to cover the entire surfaces of the vanes. The parts are preferably so constructed that the long narrow discharge ports may be easily and quickly formed by merely cutting into one edge of a flange which forms the peripheral wall of the fluid chamber.

Figure I is a vertical section of my turbine engine. Fig. II is a transverse section taken approximately on the line II—II, Fig. I. Fig. III is an enlarged vertical section taken on line III—III, Fig. I. Fig. IV is an enlarged vertical section taken approximately on the line IV—IV, Fig. I.

A designates a main housing having side walls 1 and 2, and provided with a discharge opening 3 at its upper end. A power shaft 4, passing through the side wall 1, is rotatably fitted to a bearing 5 which extends from said side wall.

6 designates an oil well formed in the bearing 5, and 7 is an oil carrying chain passing around the power shaft and arranged partly within said oil well.

The rotating elements include a vane member in the form of a disk 8 fixed to the power shaft, tubular arms 9 extending from said disk near its outer edge, and an overhanging vane carrier 10 secured to said disk by means of bolts 11 passing through said arms 9. The overhanging vane carrier 10 is preferably an annular member, recessed at its outer edge to receive a ring 12 formed integral with the arms 9.

R designates rotatable vanes formed integral with a ring 13, the latter being secured to the disk 8 by means of screws 14. The rotating elements also include rotatable vanes R′ secured to the overhanging vane carrier 10.

S designates stationary vanes arranged between the rotatable vanes R, and S′ designates stationary vanes arranged between the rotatable vanes R′.

The different vanes are arranged in circular rows the vanes R being associated with the vanes S as shown by full lines in Fig. IV; and the vanes R′ being associated with the vanes S′, as shown by dotted lines in the same view. When fluid under pressure is discharged from the inclined discharge ports D, it impinges against the vanes R and S so as to turn the rotating elements, and the direction of rotation may be reversed by shutting off the fluid from the discharge ports D and admitting fluid to the similar ports D′. The different vanes and discharge ports are so formed that when the fluid is discharged from the ports D it strikes the vanes shown by full lines in Fig.

IV with the result of turning the rotating elements in the direction indicated by the arrow X; and when the fluid is shut off from the ports D and admitted through the ports D′ (dotted lines Fig. IV) it strikes the vanes R′ and S′ so as to turn the rotating elements in the direction indicated by the dotted arrow X′.

The means for controlling the admission of fluid comprises a fluid chamber divided into compartments E and F by a partition member 16, and provided with inlet ducts 17 and 18. The inlet duct 17 communicates with the compartment E and the inlet duct 18 communicates with the compartment F. A valve seat is formed at the intake end of the ducts 17 and 18, and a disk valve 19 is fitted to said valve seat.

20 designates a centering pin extending from the inner face of valve 19, and 21 designates a valve stem rigidly secured to said valve. The valve stem passes through an admission chamber 22, through a stuffing box 23, and an operating handle 24 is secured to the outer end of said valve stem. The valve 19 is provided with a single port 25 adapted to register with either of the inlet ducts 17 and 18. When the valve occupies the position shown in Fig. III the fluid supply is shut off and the engine may be started by turning the valve in either direction to permit the fluid to flow from the valve port 25 into one of the inlet ducts 17 or 18.

26 designates a stop member (Fig. III) adapted to be engaged by a shoulder 27 on the valve 19 when the valve port 25 registers with the inlet duct 17, and adapted to be engaged by a shoulder 28 when the valve port registers with duct 18.

To insure a high degree of efficiency the discharge ports D and D′ are long narrow slots, approximately equal in length to the adjacent edges of the vanes R and R′. The fluid discharged from such slots will immediately strike the broad faces of the vanes, instead of striking a restricted area of the vanes and afterward spreading laterally.

The double fluid chamber comprises a side wall member 30 in the form of a disk having a lateral flange 31 at its outer edge. This lateral flange forms the peripheral wall of the compartment F.

One of the important features of the present invention lies in the peculiar manner of forming the long narrow discharge ports D′, for some difficulty has been experienced in forming slots of this kind. In accordance with my invention, the discharge ports D may be easily and quickly formed by sawing or otherwise cutting into the free edge of the lateral flange 31 extending from the disk 30, thus providing long narrow slots which are open at one end. When the parts are assembled the primarily open ends of the slots are closed by forcing the flange 31 into engagement with the partition member 16. The disk 30 is preferably provided with a central stem 33, screwed into the center of the partition member to firmly secure said parts together, at the same time forcing the flange 31 into engagement with the partition member to close the ends of the slots or ports D. The partition member 16 is provided with an annular flange 31′ slotted to produce the discharge ports D′. This flange extends laterally from the partition member and the primarily open ends of the slots are closed by an annular boss 35 extending from the housing wall 2.

In assembling the parts the central boss 16′ formed on the partition member 16 is screwed into the housing A as shown in Fig. I, and the central stem 33 extending from the disk 30 is screwed into the partition member. Screws 36 are inserted through the slotted flanges 31 and 31′ and screwed into the wall 2 of the housing. These screws 36 prevent the elements of the double fluid chamber from rotating with respect to the housing, also firmly securing said elements to the housing. The stationary vanes S and S′ are secured to a web 38 which forms a continuation of the partition member 16.

A supply pipe 39 is screwed into the admission chamber 22, the latter being screwed into the boss 40 extending from the housing wall 2. The valve 19 is confined between the inner end of the admission chamber and the outer face of the central boss 16′ which extends from the partition member 16. The admission chamber is firmly engaged with the valve to retain it on its seat, thereby preventing leakage around the outer edge of said valve.

It is important to note that the rotating elements do not contact with any of the stationary elements, excepting the housing wall 1 and the bearing 5 extending from said wall. The fluid, usually steam, is admitted through the housing wall 2 at a point remote from the wall 1 and bearing 5. As previously suggested, I have found it desirable to locate all of the friction surfaces at points remote from the live steam, where they will not be in any way affected by the steam. The overhanging vane carrier 10 surrounds but does not engage the fluid chamber, said overhanging member being secured to the arms 9 extending from the disk 8, and the latter being secured to the power shaft 4 which passes through the bearing 5.

I claim:—

1. A turbine engine comprising a housing, means for conducting fluid into one side of said housing, a stationary vane member secured to said side of the housing, a bearing at the opposite side of said housing, a ro-

tatable vane member extending over said stationary vane member and provided with vanes which lie at opposite sides of said stationary vane member, and a rotatable power shaft secured to said rotatable vane member, and passing through said bearing, all of said rotatable elements being supported by said bearing and at only one side of said housing.

2. A reversible turbine engine comprising a housing, a fluid chamber secured to one side of said housing, a stationary vane member secured to said fluid chamber and provided with stationary vanes at both of its sides, a rotatable vane member having vanes which lie adjacent to the stationary vanes at one side of said stationary member and provided with an overhanging vane carrier which extends over said stationary vane member and lies adjacent to the vanes at the opposite side thereof, said fluid chamber being provided with discharge ports for the discharge of fluid onto the vanes at either side of said stationary vane member, and a power shaft passing through said housing at a point opposite said fluid chamber and secured to said rotatable vane member, the overhanging vane carrier being an annular member separated from the stationary parts of the engine and all of said rotating elements being supported by said power shaft at only one side of said housing.

3. A turbine engine having a housing, a circular fluid chamber fixed to said housing, a stationary vane member having, a row of stationary vanes arranged around said fluid chamber, a rotatable vane member having vanes which lie adjacent to said stationary vanes, and a power shaft operable in response to the pressure of fluid on said rotatable vanes, said fluid chamber having side wall members and a peripheral wall member slotted at one of its edges to form peripheral discharge ports, the slotted edge of said peripheral wall member being fitted to one of said side wall members, the latter serving to close the ends of said slots.

4. A turbine engine having a housing, a circular fluid chamber fixed to said housing, a stationary vane member having a row of stationary vanes arranged around said fluid chamber, a rotatable vane member having vanes which lie adjacent to said stationary vanes, and a power shaft operable in response to the pressure of fluid on said rotatable vanes, said fluid chamber having side wall members and a peripheral wall member formed integral with one of said side wall members, said peripheral wall member being slotted at one of its edges to form narrow discharge ports approximately equal in length to the edges of the vanes which lie adjacent to said narrow discharge ports, the slotted edge of said peripheral wall member being closely fitted to one of said side wall members so as to close the ends of the slots.

5. A turbine engine comprising a main casing, a fluid chamber within said main casing, a stationary vane member, and a rotatable vane member adjacent to said stationary vane member; said fluid chamber including a peripheral wall member having discharge ports for the discharge of fluid onto said vane members, and side wall members on opposite sides of said peripheral wall member, one of said side wall members having a threaded extension which is screwed into a portion of said main casing to firmly secure the elements of said fluid chamber to said main casing.

6. A turbine engine comprising a casing, a fluid chamber within said casing, a stationary vane member provided with vanes at both of its sides, a rotatable vane member extending over said stationary vane member and provided with sets of vanes which lie adjacent to the vanes on said stationary member, said fluid chamber comprising a partition member having an extension which is screwed into said casing and also having a circular flange which engages said casing, a side wall member having a threaded stem which is screwed into said partition member, said side wall member being provided with a lateral flange which firmly engages said partition member and bolts passing through said flanges to secure the fluid chamber to said casing, said flanges being provided with discharge ports for the discharge of fluid onto said vanes.

7. An engine comprising a housing, a stationary vane member provided with two sets of vanes, a rotatable vane member provided with two sets of vanes, a fluid chamber arranged within said housing and surrounded by said vanes, said fluid chamber being divided into two discharge compartments and provided with two inlet ducts each of which leads to only one of said discharge compartments, a valve seat being formed at the intake ends of said ducts, a disk valve fitted to said valve seat, and means for rocking said disk valve to control the admission of fluid to said inlet ducts.

8. An engine comprising a housing, a stationary vane member provided with two sets of vanes, a rotatable vane member provided with two sets of vanes, a fluid chamber arranged within said housing and surrounded by said vanes, said fluid chamber being divided into two discharge compartments and provided with two inlet ducts each of which leads to only one of said discharge compartments, a valve seat being formed at the intake ends of said ducts, a disk valve fitted to said valve seat, and a screw threaded member operable to force said disk valve into engagement with said valve seat.

9. A turbine engine having a stationary

vane member provided with vanes on both of its sides, and a rotatable vane member including two circular vane carriers arranged on opposite sides of said stationary vane member, arms extending from one of said circular vane carriers, a ring formed integral with said arms and fitted to the other circular vane carrier and connecting members passing through said arms.

LOUIS S. FLATAU.

In the presence of—
A. J. McCauley,
E. K. Clark.

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