

June 16, 1936.

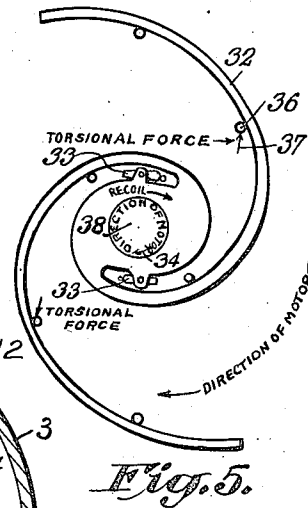
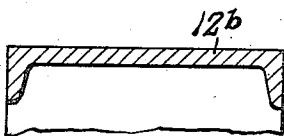
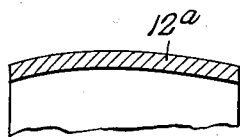
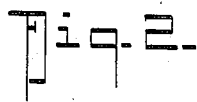
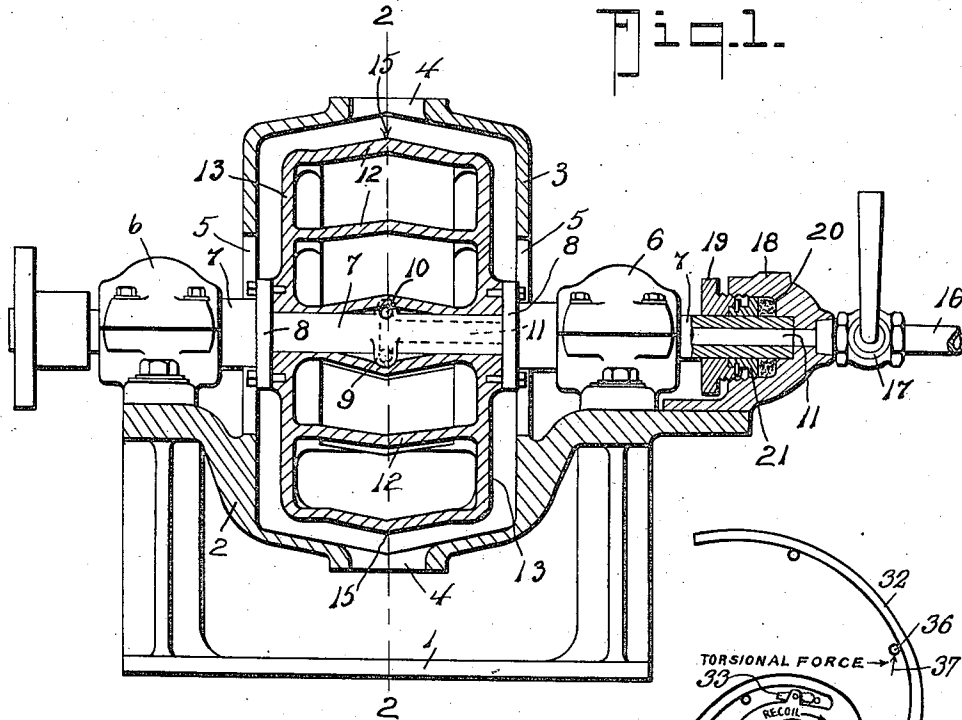
W. P. KESSEL

2,044,532

TURBINE

Filed Sept. 20, 1934

2 Sheets-Sheet 1



Inventor

William F. Kessel

By Albert E. Dieterich

Attorney

June 16, 1936.

W. P. KESSEL

2,044,532

TURBINE

Filed Sept. 20, 1934

2 Sheets-Sheet 2

Fig. 3.

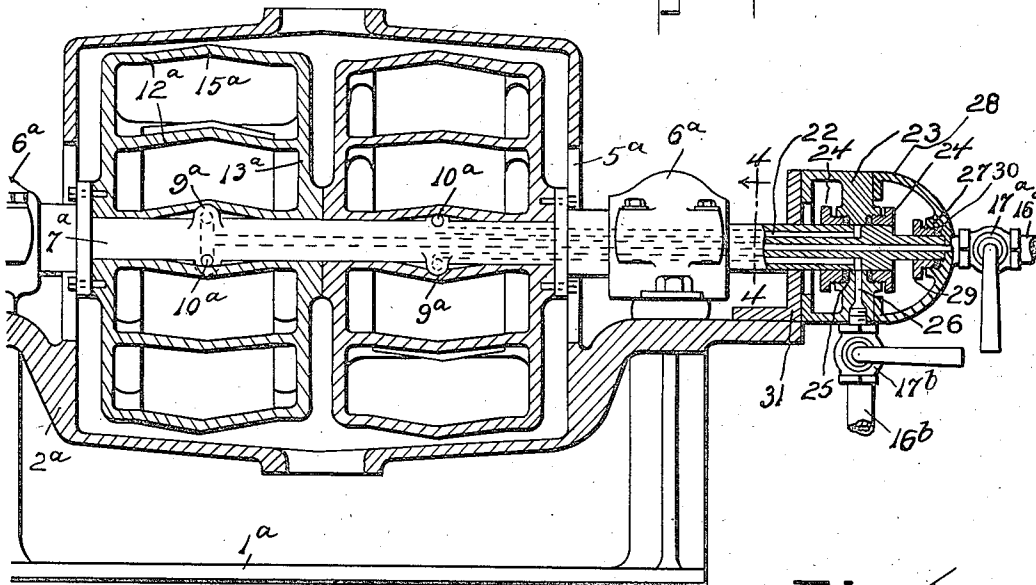


Fig. 4.

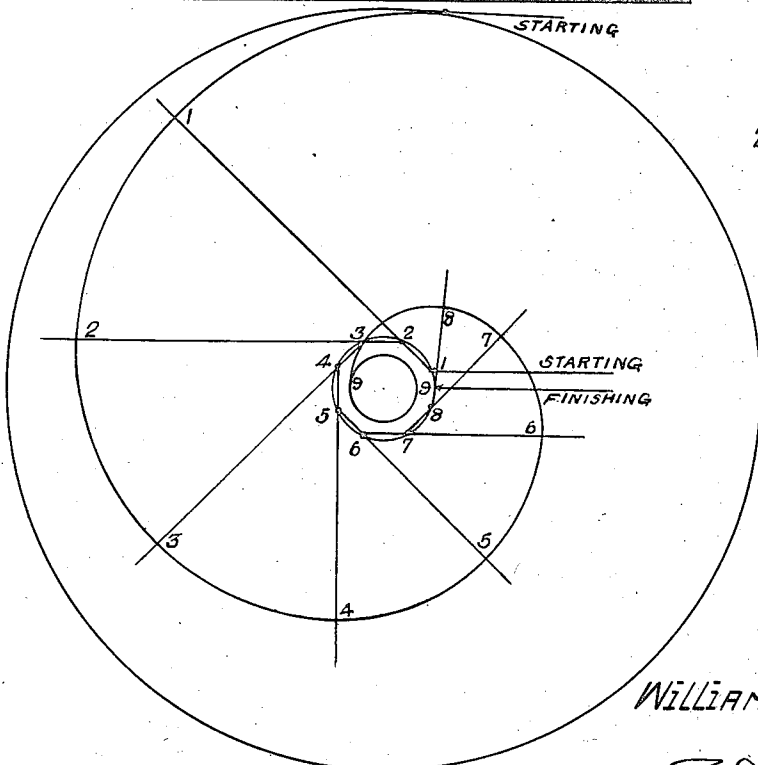
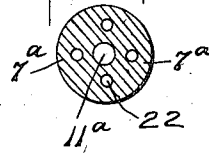


Fig. 8.

Inventor

WILLIAM P. KESSEL

By *Albert E. Dieterich*

Attorney

UNITED STATES PATENT OFFICE

2,044,532

TURBINE

William Philip Kessel, San Francisco, Calif.

Application September 20, 1934, Serial No. 744,847

13 Claims. (Cl. 253—79)

My present invention relates to a fluid operated turbine and it has for its principal object to provide a turbine having a spiral-bladed wheel deriving torsional energy and power from liquid or gaseous fluid forced or expanded from the periphery of a central bore or chamber toward the periphery of the wheel in a manner whereby the action and reaction of the fluid stream forces are, by nature of my turbine construction, brought to act in unison in driving the wheel and its shaft.

Further, it is an object to provide a turbine with a hollow drive shaft that is provided with fluid escape nozzles located at the center of the wheel, which shaft thus becomes, itself, a turbine.

Further, it is an object to provide a turbine wheel with spiral blades against which the fluid is delivered from the shaft's nozzles outwardly toward the periphery of the wheel, the side of the wheel and its casing having breather openings whereby the spiral motion, in addition to the fluid expansion, will draw in free air; this construction I find results in a high degree of efficiency.

A further object is to provide a reversible turbine of the character stated.

A further object is to provide a turbine of a simple, inexpensive construction in which the parts are easily accessible and are effectively held together to operate at as high an efficiency as possible, and which can readily be started under load.

Other objects will in part be obvious and in part be pointed out hereinafter.

To the attainment of the aforesaid objects and ends, the invention still further resides in the novel details of construction, combination and arrangement of parts, all of which will be first fully described in the following detailed description, and then be particularly pointed out in the appended claims, reference being had to the accompanying drawings, in which:—

Figure 1 is a central vertical longitudinal section on the line 1—1 of Figure 2, showing a preferred embodiment of my invention constructed as a non-reversible turbine, parts being shown in elevation.

Figure 2 is a vertical cross section on the line 2—2 of Figure 1.

Figure 3 is a central longitudinal section of a reversible turbine according to my invention.

Figure 4 is a cross section on the line 4—4 of Figure 3.

Figure 5 is a diagrammatic view hereinafter specifically referred to.

Figures 6 and 7 are detailed cross sectional views

showing modified forms of blades hereinafter referred to.

Figure 8 is a diagrammatic view hereinafter referred to.

In the drawings, in which like numerals of reference indicate like parts in all of the figures, 1 represents a suitable supporting bed to which the base 2 of the turbine casing 3 is secured. The casing 3 is provided with exhaust openings 4 designed to be connected to a condenser if desired, and 5 indicates breather inlets in the sides of the casing 3.

Suitable shaft bearings 6 are mounted on the base 2 to support the power shaft 7. Located between suitable collars 8 on the shaft 7 is the turbine wheel which comprises spiral blades 12 and sides 13, the latter having openings 14 as indicated. The spiral blades, it will be observed, are crowned as at 15 so that the greatest diameter of the blades appears at the center, the blades slanting off from the central plane toward the sides 13. Curved blades, or straight blades with a narrow outer rim may be provided instead (see Figures 6 and 7 respectively).

At the center of the wheel are located the nozzles 9 which are formed on or carried by the shaft 7. The nozzles 9 are preferably also of spiral form conforming to the spiral curvature of the turbine wheel blades. The nozzles 9 have their outlets 10 arranged to discharge the fluid approximately in a tangential direction against the central or inner ends of the turbine blades. Fluid is conducted from a suitable source, such as a supply pipe 16, through a control valve 17 into a duct 11 in the shaft 7, the duct 11 delivering the fluid to the nozzles 9, under constant pressure.

A gland coupling 18 is mounted on the base 2 and is bored to receive an end of the shaft 7 through which the duct 11 receives its fluid supply, there being a suitable packing 20, gland cap 21 and gland nut 19 provided to cooperate with the gland coupling 18. The parts 18 to 21, inclusive, constitute a stuffing box.

When the turbine is to be a reversible one, a second wheel is mounted on the shaft, as indicated at 7a in Figure 3, the spiral blades 12a of which are pitched in a direction reversely to that of the blades 12. In this construction also the shaft 7a is provided with supplemental fluid ducts 22 in addition to the duct 11a which delivers the fluid for the first wheel, and shaft 7a, in the reversible turbine, is passed through a fluid supply fitting 23 secured to the upwardly projecting portion 31 of the base 2. Packing nuts 24 and pack-

ing 25 are provided, and a fluid duct 26 delivers motive fluid from the control valve 17b to the supplemental ducts 22, a fluid supply pipe 16b being connected to the valve 17b.

5 A second fitting 23 is provided with a packing box or gland 27, packing nut 29 and packing 30 into which the end of the shaft 7a projects to receive from a fluid supply pipe 16a, via a control valve 17a, the motive fluid for delivery through the duct 11a to the first turbine wheel.

10 In Figure 5 is shown diagrammatically what I know to be the principle upon which my turbine operates. In this figure 32 represents the nebular-spiral blades of a turbine wheel and 33 the fluid discharge nozzles which deliver the motive fluid at the center of the wheel against the spiral blades. The arrow 34 indicates the direction of rotation of the wheel, the arrow 35 indicates the direction of recoil at the nozzles 33, and 36 indicates an atom of motive fluid, while 37 indicates the direction of the torsional force. Based on my theory of evolution of the spiral nebula, Figure 5 illustrates how two opposing forces, action and reaction, are caused to function in unison of rotative direction. Let the projectile atom 25 35 represent force of action; let recoil at nozzle 33 represent force of reaction; then it will be found that the two opposing forces, because of the nature of the spiral construction, are caused to function in unison, both exerting torsional force in the same direction of rotative motion whereby the entire spiral is caused to rotate around its axis 38.

When I refer herein to "nebular-spiral" curvatures I have reference to such curvature as is obtainable by the following formula: Refer to Figure 8 wherein is illustrated diagrammatically a formula for determining the nebular-spiral curvature of the spiral blades. My formula of the proportion of the nebular-spiral has been based upon observation of the plan of the nebulae, and upon conjectural experimentation with spiral blades under fluid pressures, and from analyzed results I have found that the diameter of the gaseous center of the nebula is a trifle more than one-eighth of the diameter of the entire nebula, or a diametrical ratio of 2 to 15%. As the spiral arms of the nebulae begin at the periphery of the gaseous center, so the spiral walls of the spiral blades of my turbine are constructed to begin at the periphery of the circle, circumscribed by the cylindrical inlet chamber of the hub, but the geometrical formula will be described by drawing the spiral from the outer periphery toward the center.

55 The formula: Describe two concentric circles with diametrical ratio of 2 to 15%. Divide the smaller circle into eight equal arcs of 45 degrees each and extend chords through the arcs, as from point 1 through point 2, point 2 through point 3, point 3 through point 4, etc., of the larger circle shown in the diagrammatic Figure 8 of the drawings. Begin drawing the spiral, centrally, from a point in the periphery of the larger circle, having first selected any one of the 45 degree arc centers as a starting point, say point 9; continue the circular spiral sweep until the extended chord is reached, then shift the center and continue until the spiral has been completed except for the final curvature, which must be drawn from a ninth center (number 9 on the diagram of a 22½ degree arc. This curvature finishes the spiral and continues through the limb of the smaller circle, thereby describing the curvature of the outer or 70 inner wall, as the case may be, of the spiral blade

of the rotor and terminating at the periphery of the central cavity, the diametrical extent of which has now been determined by the point of the spiral termination.

While in the drawings I have illustrated the spiral blade as of but 360 degrees in length, the extension of the spiral in general is of course in relation to the nozzle or jet opening; or, in other words, dependent on the fluid velocity and volume, the limit of size being dependent only on the 10 strength of materials.

In view of the foregoing it is obvious that the invention centers upon the discovery of the curve of the nebular spiral, for example, see spirals in Canes Venatici and in Ursa Major, and of the 15 radial expansion of the fluid from its immediate course, the fulcrum.

From the foregoing description, taken in connection with the accompanying drawings, it is thought that the construction, operation and advantages of my invention will be clear to those skilled in the art to which it appertains.

What I claim is:

1. In a turbine, a casing, a shaft passing through said casing and having a fluid duct and 25 a discharge nozzle arranged to discharge approximately tangentially to the shaft, a rotor on said shaft within said casing and having a spiral blade, said nozzle discharging against the inner extremity of said blade, said casing having an 30 exhaust opening at its periphery.

2. In a turbine, a casing, a shaft passing through said casing and having a fluid duct and a discharge nozzle arranged to discharge approximately tangentially to the shaft, a rotor on 35 said shaft, within said casing and having a spiral blade, said nozzle discharging against the inner extremity of said blade, said casing having an exhaust opening at its periphery, and said rotor having side walls with openings.

3. In a turbine, a casing, a shaft passing through said casing and having a fluid duct and a discharge nozzle arranged to discharge approximately tangentially to the shaft, a rotor on said shaft within said casing and having a spiral 45 blade, said nozzle discharging against the inner extremity of said blade, said casing having an exhaust opening at its periphery, and said casing having breather openings.

4. In a turbine, a casing, a shaft passing 50 through said casing and having a fluid duct and a discharge nozzle arranged to discharge approximately tangentially to the shaft, a rotor on said shaft within said casing and having a spiral blade, said nozzle discharging against the inner 55 extremity of said blade, said casing having an exhaust opening at its periphery, said casing having breather openings and said rotor having side walls with openings.

5. In a turbine, a rotor having nebular-spiral 60 blades and being provided with a constant fluid pressure duct at its approximate center, means for delivering fluid from said duct to said blades for rotating the rotor, a casing enclosing the rotor and having a peripheral exhaust opening 65 and having breather openings in its sides adjacent the center of the rotor, said rotor being open at its sides adjacent the blades.

6. In a rotary turbine, a casing, a wheel rotating in said casing, said wheel being provided with 70 nebular-spiral blades extending from the approximate center to the periphery thereof, means for establishing at the center of the rotor a constant fluid pressure and means for tangentially delivering the fluid at the center of the rotor 75

to the blades for nebular expansion at constant pressure in virtue of which said rotor derives torsional energy.

7. In a turbine, a rotatable shaft having a fluid duct and at least one discharge nozzle with a tangential outlet, a wheel on and rotatable with said shaft, said wheel having at least one nebular-spiral blade against the inner central extremity of which the nozzle discharges.

8. In a turbine, a rotatable shaft having a fluid duct and at least one discharge nozzle with a tangential outlet, a wheel on and rotatable with said shaft, said wheel having at least one nebular-spiral blade against the inner central extremity of which the nozzle discharges, a second wheel on said shaft having at least one nebular-spiral blade directed opposite to the first wheel's blade, said shaft having a second fluid duct and nozzle for said second wheel, and means separately to admit said working fluid to said ducts.

9. In a turbine, a rotatable shaft, having a fluid duct and at least one discharge nozzle, a casing into which said shaft passes, a wheel mounted on and rotatable with said shaft within said casing, said casing having exhaust outlets and breather inlets, said wheel having at least one nebular-spiral blade against the inner central portion of which the nozzle discharges, the sides of said wheel adjacent said blade being open.

10. In a turbine, a rotatable shaft having a fluid duct and at least one discharge nozzle, a casing into which said shaft passes, a wheel mounted on and rotatable with said shaft within said casing, said casing having exhaust outlets and breather inlets, said wheel having at least one nebular-spiral blade against the inner central portion of which the nozzle discharges, a second

wheel within the casing and on said shaft, and having at least one nebular-spiral blade directed opposite to the first wheel's blade, said shaft having a second fluid duct and nozzle for said second wheel, and means separately to admit said working fluid to said ducts, the sides of said wheels adjacent said blades being open.

11. In a turbine, a shaft having a longitudinal fluid passage and having a tangentially disposed discharge nozzle, a rotor mounted on said shaft over said nozzle, said rotor comprising a body having open sides and a peripheral nebular-spiral blade the inner end of which lies adjacent said nozzle to receive fluid therefrom.

12. In a turbine, a shaft having a longitudinal fluid passage and having a tangentially disposed discharge nozzle, a rotor mounted on said shaft over said nozzle, said rotor comprising a body having open sides and a peripheral nebular-spiral blade the inner end of which lies adjacent said nozzle to receive fluid therefrom, and a casing enclosing said rotor, said casing having an exhaust port in its periphery and side openings adjacent the axis of said rotor for the purpose described.

13. In a fluid propelled nebular-spiral turbine, a casing having openings in its sides, a hollow self-propelled drive shaft passing through said casing and having a fluid duct and fluid discharge nozzles, nebular-spiral blades mounted on said shaft, said fluid discharge nozzles conforming in curvature to that of said blades in virtue of which the action and reaction of the fluid stream force is caused to function as a single accelerating resultant force to drive the turbine.

WILLIAM PHILIP KESSEL.