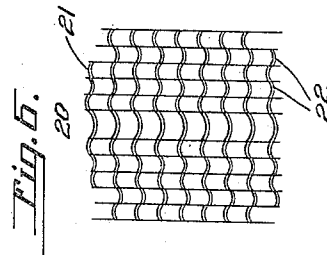
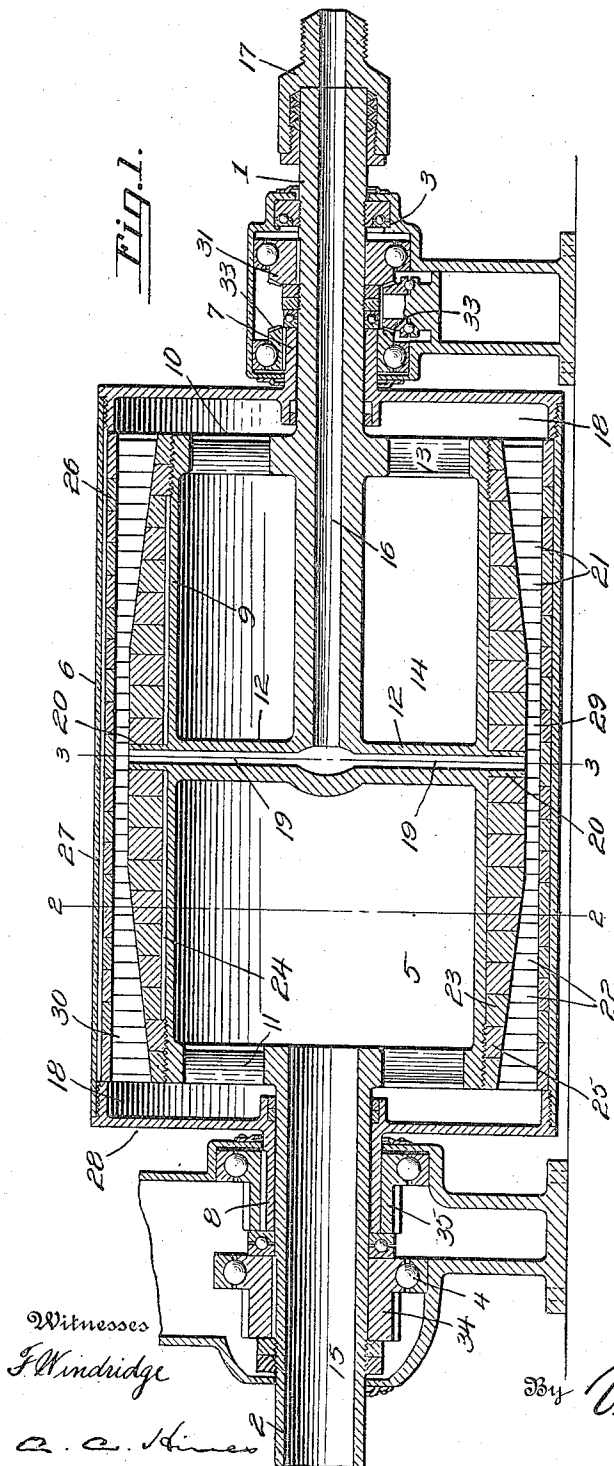


1,216,162.

Patented Feb. 13, 1917.

2 SHEETS—SHEET 1.



Witnesses
J. Windridge
C. C. Hines

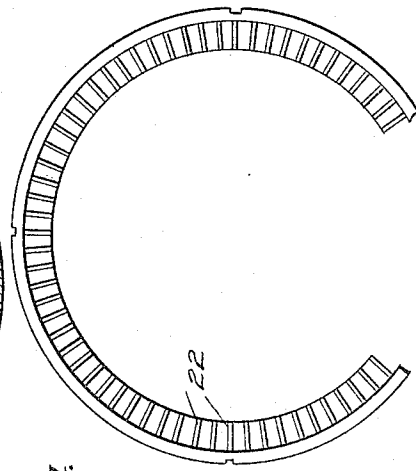
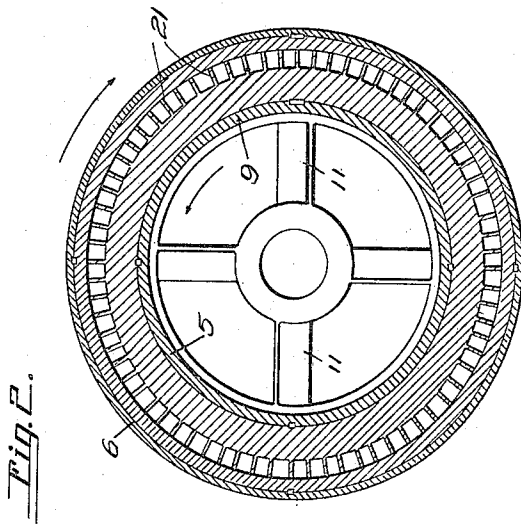
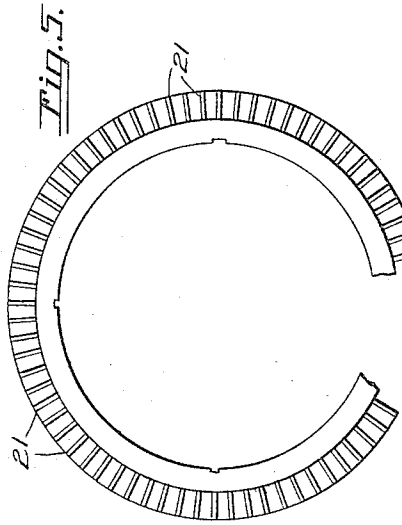
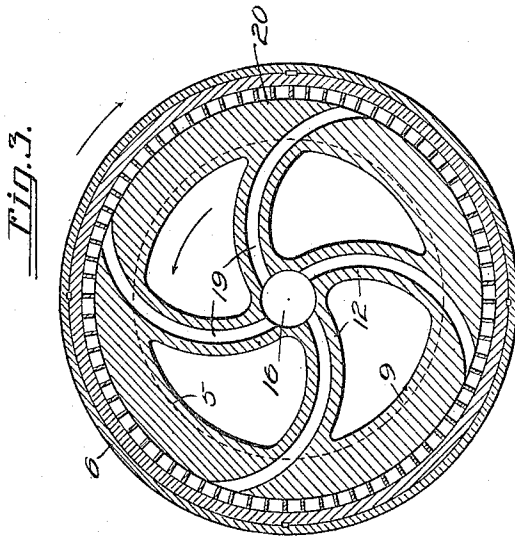
Inventor
M. A. Pratt.

Victor J. Evans

Attorney

1,216,162.

Patented Feb. 13, 1917.
2 SHEETS—SHEET 2.



Witnesses
F. W. Kindridge
A. C. Hines

Inventor
M. A. Pratt
By *Victor J. Evans*
Attorney

UNITED STATES PATENT OFFICE.

MILFORD A. PRATT, OF LEBANON, INDIANA.

TURBINE-ENGINE.

1,216,162.

Specification of Letters Patent.

Patented Feb. 13, 1917.

Application filed March 21, 1916. Serial No. 85,679.

To all whom it may concern:

Be it known that I, MILFORD A. PRATT, a citizen of the United States, residing at Lebanon, in the county of Boone and State of Indiana, have invented new and useful Improvements in Turbine-Engines, of which the following is a specification.

This invention relates to turbine engines designed to be operated by air or other fluid pressure, and particularly adapted for driving the concentrically mounted propellers of torpedoes, and for other similar purposes.

One object of the invention is to provide a turbine engine wherein the casing and rotor are provided with cooperating vanes or fins constructed and arranged to receive the impact and utilize the expansive force of the fluid in such a way as to secure a driving action while obtaining a balancing of pressures so as to avoid undue endwise thrust in either direction of or upon the engine shaft.

A further object of the invention is to provide an engine of the character described wherein the casing constitutes an outer rotor and the blades or vanes upon the perimeter of the casing and periphery of the rotor proper are formed to direct the fluid laterally in opposite directions simultaneously against the vanes of both rotors to drive the same in opposite directions while diminishing endwise thrust pressures to the minimum degree.

A still further object of the invention is to provide an engine of the character described wherein the vanes upon the surfaces of the cooperating parts above referred to are arranged so as to provide expansion chambers of novel construction, formation and arrangement whereby the free expansion of the fluid is permitted and obtained for the utilization of the full forces thereof and for securing a free and unrestricted discharge of the spent fluid through the exhaust without undue resistance or back pressure.

A still further object of the invention is to provide an engine of the character described embodying novel forms of fins or vanes for the purposes described, a novel construction and arrangement of intake and exhaust passages, a novel mode of constructing and mounting the vane carrying rings, and novel means for connecting the inner and outer rotors for operation at a uniform

speed and for transmitting motion therefrom to the parts to be driven.

With these and other objects in view, the invention consists of the features of construction, combination and arrangement of parts hereinafter fully described and claimed, reference being had to the accompanying drawings in which:—

Figure 1 is a central vertical longitudinal section through a turbine engine constructed in accordance with my invention.

Fig. 2 is a vertical transverse section through the engine on the line 2—2 of Fig. 1.

Fig. 3 is a vertical transverse section through the engine on the line 3—3 of Fig. 1.

Figs. 4 and 5 are side views showing one of the outer and one of the inner vane carrying rings respectively applied to the casing and inner rotor or piston.

Fig. 6 is a diagrammatic plan view showing the arrangement of the vanes upon the rotating elements of the engine at a time when adjacent vanes register with each other.

Referring to the drawings, 1 and 2 respectively designate the ends of the engine shaft which are journaled in suitable anti-friction bearings 3 and 4 and are suitably fixed to the ends of an inner rotor 5 arranged within a casing or outer rotor 6 having hollow end shaft sections 7 and 8 mounted to respectively revolve upon the said engine shaft sections 1 and 2.

The inner rotor 5 comprises a cylindrical body 9 provided at its opposite ends with sets of radial spokes 10 and 11 and having a central set or series of spirally disposed spokes 12, the main shaft section 1 being suitably connected with the spokes 10 and 12, while the main shaft section 2 is suitably connected with the spokes 11. The spokes are properly spaced apart to provide exhaust passages 13 communicating with an exhaust chamber 14 formed within the body of the rotor 5 and which is in unrestricted communication with an exhaust passage 15 in the main shaft section 2, the shaft section 1 being provided with an admission or feed passage 16 communicating with the fluid supply pipe 17.

The chamber 5 is in open communication with expansion chambers 18 provided between the ends of the inner and outer rotors, while the feed passage 16 connects at its inner end with fluid delivery ducts or

channels 19 formed in the spiral or serpentine shaped central spokes 12. These ducts 19 are accordingly also of serpentine or spiral shape and open at their outer ends through a central peripheral flange or annulus 20 upon the periphery of the inner rotor, whereby the fluid is discharged between the working surfaces of the inner and outer rotors for imparting motion thereto.

10 Provided upon the periphery of the rotor 5 are blades, fins or vanes 21, and provided upon the perimeter of the casing or outer rotor 6 are cooperating blades, fins or vanes 22, all except the central series of vanes 21, 15 which are provided upon the flange 20, being carried by rings 23 keyed, as shown at 24, to the periphery of the rotor 5 and clamped in position against the central flange 20 by outer threaded pairs of retaining rings 25. The vanes 22 are similarly 20 carried by rings 26 which are keyed to the perimeter of the rotor 6, as at 27, and are held or clamped in position between the removable end heads 28 of said rotor 6, which 25 are provided with the hollow shaft sections 7 and 8.

It will be observed that the vanes 21 and 22 upon the series of rings on the inner and outer rotors are arranged in alternation 30 with each other from the center toward the opposite ends of the rotors, and that the alternating vanes are curved on arcs in different directions so as to collectively present a fluted or corrugated surface in a direction 35 transversely to the axis of the motor when the vanes come into transverse alinement or registration. Hence it will be apparent that the sets of vanes provide zigzag channels between them at right angles to the axis of 40 rotation of the rotors for the travel of the fluid laterally and longitudinally in opposite directions, and that the fluid is thus caused to exert its impact as well as its expansive force simultaneously upon the sets 45 of vanes in opposite directions, thereby driving the rotor 5 in one direction and the rotor 6 in the opposite direction. By this action and the escape of the fluid laterally as well as longitudinally in opposite directions in 50 its course of travel, it will be evident that the working thrust will be taken up entirely and expended laterally by the rotor vanes, thus entirely preventing reducing end thrust upon the shaft sections to the minimum.

55 It will be observed further that the rings 23 are of the same diameter at the center of the rotor 5 and for like distances on opposite sides of the central flange 20, but beyond these points and between the same and 60 the ends of the rotor progressively decrease in diameter, thus providing a central annular fluid channel 29 for the flow of the fluid during its impact action and expansion chambers 30 which progressively increase in 65 area and depth longitudinally and radially

toward the spaces or chambers 18, allowing the fluid to expand freely and easily and so as to avoid any tendency to back pressure or frictional resistance liable to cause slippage and diminish power and speed. The 70 fluid after exerting its working forces may therefore discharge into the spaces 18 and through the passages at the ends of the inner rotor into the chamber 5 and out through the exhaust passage 15 in the main shaft 75 section 2. The end spokes 11 of the rotor 5 are preferably made fan-shaped to serve as propeller blades and thus create a suction to promote the discharge of the exhaust.

While the engine may be employed for 80 general use for driving various types or kinds of machines or elements to be driven, it is particularly intended for use in driving the concentric shafts of oppositely rotating propellers, such as of a torpedo or for analogous purposes, and it is therefore desirable 85 to have a balanced action of the engine and the operation of the rotors at uniform speed. To this end the shaft sections 1 and 7 are provided with gear elements 31 and 32 90 which mesh with an intervening equalizing gear element 33 suitably journaled on the bearing element 3, so that the rotors will be caused to have a balanced rotary action and to turn at equivalent speeds. Suitable 95 means may be provided for transmitting motion from the rotors to the parts to be driven, and in the present instance I have shown for this purpose gear elements 34 and 35 mounted upon the shaft sections 2 100 and 8 and from which motion may be transmitted through suitable gearing (not shown) to the propeller shafts or other parts to be driven for driving the same in opposite directions at corresponding speeds. 105

While the construction shown and described is preferred, it will of course be understood that modifications within the scope of the appended claims may be made without departing from the spirit or sacrificing 110 any of the advantages of the invention. It is also to be understood that while the engine is expressly designed for the use of compressed air as the impelling agent, any other suitable motive fluid may be employed. 115

I claim:—

1. An elastic fluid turbine including inner and outer rotors provided with cooperating vanes, the inner rotor consisting of a hollow body forming an exhaust chamber communicating with the spaces between the vanes, and means for supplying a motive fluid to act upon the vanes. 120

2. An elastic fluid turbine including inner and outer rotors provided with cooperating 125 vanes, an inner rotor consisting of a hollow body forming an exhaust chamber, communicating with the spaces between the vanes, propeller blades upon said inner rotor forming a suction and discharge vane to promote 130

the discharge of the exhaust, and means for supplying a motive fluid to act upon the vanes.

3. An elastic fluid turbine including inner and outer concentrically mounted rotors provided with cooperating vanes, the inner rotor consisting of a hollow body forming an exhaust chamber and arranged to provide exhaust passages at the ends of the outer rotor communicating therewith and with the spaces between the vanes, means extending through said inner rotor for supplying a motive fluid to the vanes, and means communicating with the exhaust chamber of said rotor for the discharge of the exhaust therefrom.

4. An elastic fluid turbine including a casing, a rotor arranged within the casing and comprising a hollow body forming an internal exhaust chamber and having spokes extending to the center of its periphery and provided with fluid supply ducts, said rotor being of less length than the casing to provide expansion spaces at the ends of the casing in communication with said expansion chamber, and vanes upon the peripheral surfaces of the casing and rotor.

5. An elastic fluid turbine including a main shaft having hollow admission and exhaust sections, a casing having hollow

shaft portions mounted to turn upon the said sections of the main shaft, a rotor arranged within the casing and comprising a hollow body forming an internal exhaust chamber and having spokes extending to the center of its periphery and provided with fluid supply ducts communicating with the bore of the admission section of the shaft, said rotor being of less length than the casing to provide expansion spaces at the ends of the casing in communication with said expansion chamber, and said chamber being in communication with the exhaust section of the shaft, and vanes upon the peripheral surfaces of the casing and rotor.

6. An elastic fluid turbine including inner and outer rotors provided with cooperating vanes, the inner rotor consisting of a hollow body forming an exhaust chamber and provided with propeller blades at the ends thereof to form a suction to promote the discharge of the exhaust, and means for supplying a motive fluid to act upon the vanes.

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

MILFORD A. PRATT.

Witnesses:

MORT L. BUTCHER,
A. A. WILLIAMSON.

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