

July 10, 1923.

1,461,699

L. DE SANTIS

TURBINE

Filed Aug. 10, 1921

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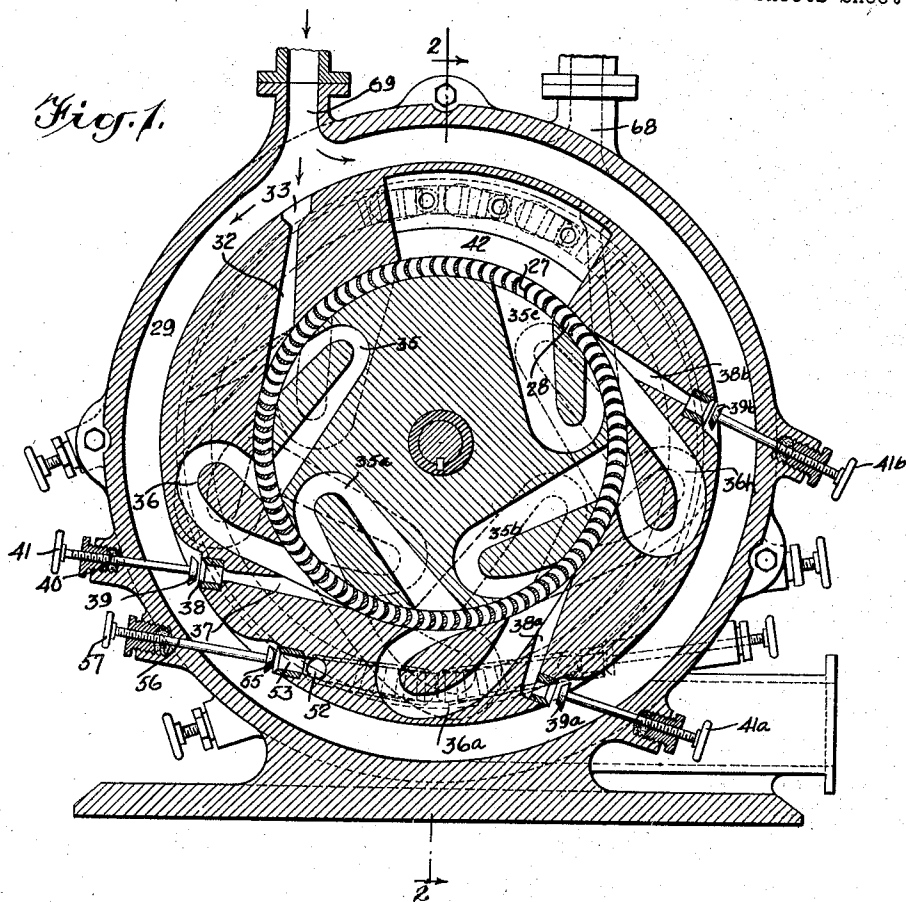
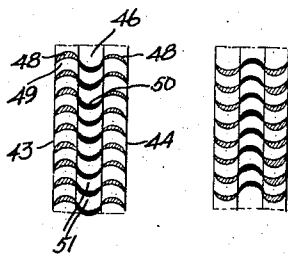


Fig. 5.



WITNESSES
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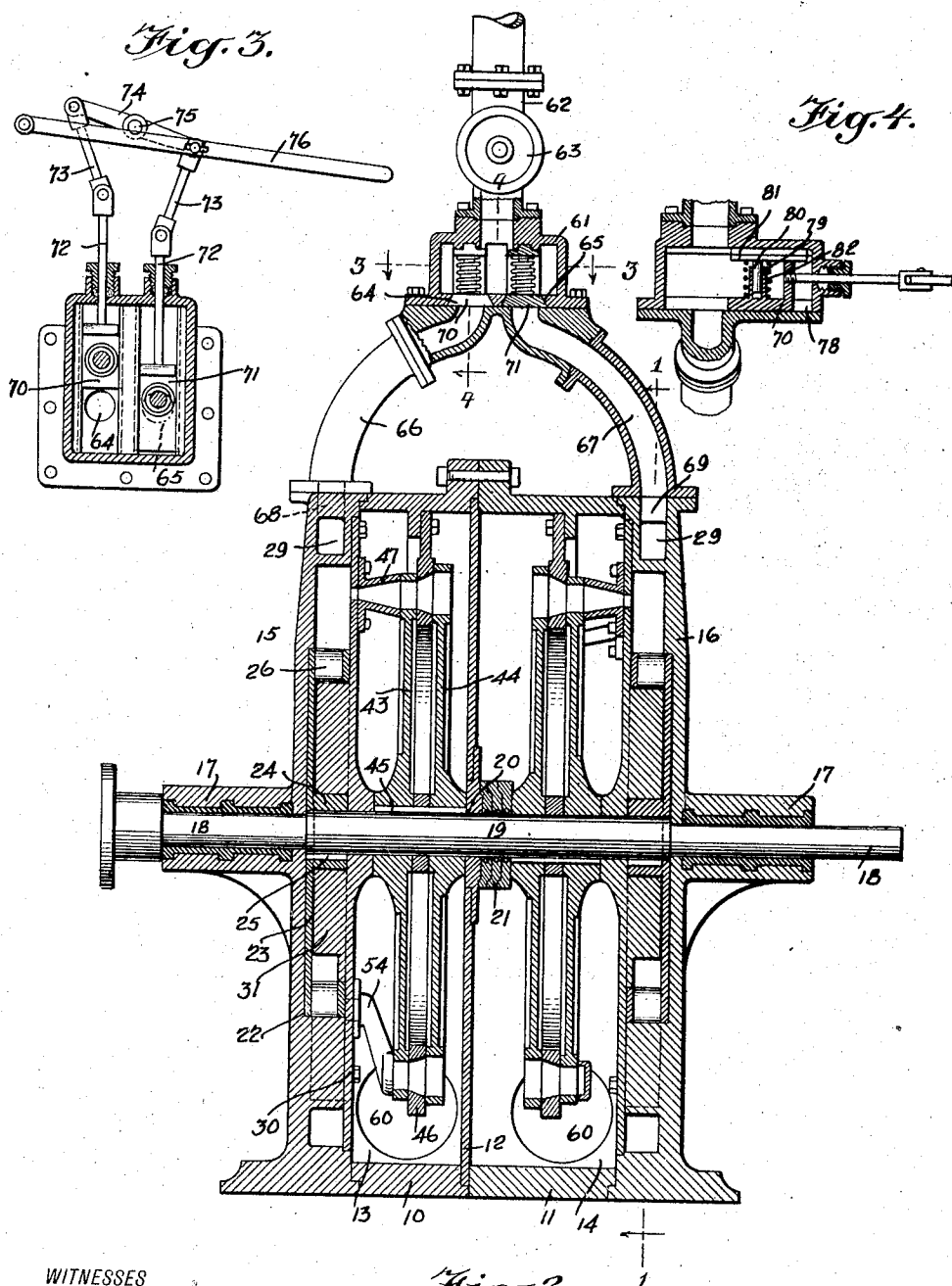
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WITNESSES
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Fig. 2.

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UNITED STATES PATENT OFFICE.

LOUIS DE SANTIS, OF YONKERS, NEW YORK.

TURBINE.

Application filed August 10, 1921. Serial No. 491,314.

To all whom it may concern:

Be it known that I, LOUIS DE SANTIS, a citizen of the United States, and a resident of Yonkers, in the county of Westchester and State of New York, have invented a new and Improved Turbine, of which the following is a full, clear, and exact description.

This invention relates to engines of the rotary type and refers more particularly to fluid actuated turbines.

Primarily the invention contemplates a turbine having independently actuated rotor units mounted on a common drive shaft and arranged in a common housing whereby the reverse driving of the drive shaft may be obtained and whereby when one of said units is actuated, the other inactive unit will constitute a balance or flywheel for the other.

The invention further contemplates a novel controlling valve which serves as a means for rendering one of the rotor units inactive when the other unit is rendered active.

A further object and advantage of the invention resides in the provision of a turbine having a primary intake leading from an annular fluid supply chamber surrounding the rotor and a plurality of auxiliary intakes leading from said supply chamber and circumferentially distributed about the rotor, together with manually controlled means for opening and closing the auxiliary intakes to increase or decrease the pressure against the rotor at various points in its orbit.

With the above recited and other objects in view the invention resides in the novel construction, combination and arrangement of parts set forth in the following specification, particularly pointed out in the appended claims and illustrated in the accompanying drawings, it being understood that the right is reserved to embodiments other than those actually illustrated herein to the full extent indicated by the general meaning of the terms in which the claims are expressed and by variations in the phraseology of the same.

In the drawings—

Figure 1 is a transverse sectional view through a turbine constructed in accordance with the invention, said section being taken approximately on the line indicated at 1—1 in Figure 2;

Figure 2 is a longitudinal sectional view taken approximately on the line 2—2 of Figure 1;

Figure 3 is a detail horizontal sectional view through the control valve taken approximately on the line 3—3 of Figure 2;

Figure 4 is a fragmentary vertical sectional view taken approximately on the line 4—4 of Figure 2; and

Figure 5 is a diagrammatic view of the low pressure rotor blades of each rotor unit.

Referring to the drawings by characters of reference, the turbine consists of a pair of open ended cylindrical sections 10 and 11 joined together at their confronting ends and having interposed therebetween a central separating wall 12 to divide the casing into separate compartments 13 and 14. The outer open ends of the compartments 13 and 14 are respectively closed by the end walls 15 and 16, which are of substantially identical construction, each being provided with a centrally arranged, outwardly projecting boss 17 having an opening therethrough to provide a bearing for the opposite reduced extremities 18 of a common drive shaft 19, said drive shaft extending through a central opening 20 in the central wall 12. A suitable form of thrust bearing and packing member 21 is arranged adjacent the opening 20 for preventing communication from one compartment to the other. The end walls 15 and 16 are provided on their inner face with a concentric recess or depression 22 in which the web 23 of the high pressure rotor is snugly received, the hub 24 thereof being keyed as at 25, to the drive shaft. The rotor 26 is of annular formation and is in the nature of an outwardly projecting rim provided with blades 27 defining pockets 28 therebetween, said pockets and blades being radially disposed with respect to the drive shaft. The walls 15 and 16 are further provided with annular concentric fluid supply chambers 29 spaced from the recesses 22. A covering wall 30 having a concentric annular boss 31 is secured over the inner face of each end wall with the boss 31 thereof projecting into the recess 22. The end walls are provided with primary intake ports 32 for establishing communication between the fluid supply chamber 29 and the pockets 28 of the rotor. Preferably the primary intake port is provided with a funnel-shaped inlet end 33 and a flared outlet end whereby the fluid in pass-

ing through the intake port will coact with a plurality of the blades and pockets of the rotor simultaneously. Adjacent the outlet end of the intake port, the boss 31 is provided with a substantially U-shaped by-pass 35, which receives the fluid passing from the pockets 28 and transmits the same to other pockets in advance. Likewise at the point of juncture of the exhaust end of the by-pass 35, the end wall is provided with a similar U-shaped by-pass 36, the same being of a slightly greater size than the primary by-pass 35. At the outlet end of the by-pass 36 an auxiliary intake port 37 joins the same, the inlet end 38 thereof being provided with a valve seat with which a closure valve 39 coacts, said valve 39 being provided with a stem 40 extending through and projecting from the outer peripheral wall of the fluid supply chamber and provided with a manipulating knob 41.

At the outlet end of the by-pass 36 on the opposite side of the rotor a by-pass 35^a is provided in the boss 31. Additional by-passes 35^b and 35^c are provided in the boss and additional by-passes 36^a and 36^b are provided in the end walls, said by-passes being arranged in alternation and each of a gradually increasing size. At the juncture of each of the by-passes 36^a and 36^b, an auxiliary intake port 38^a and 38^b is provided, the same being controlled by a valve 39^a and 39^b with their exteriorly disposed manipulating knobs 41^a and 41^b. Between the by-pass 35^c and the intake port 32 an exhaust chamber 42 is provided in each end wall, said exhaust being adapted to receive the fluid which is passed between the blades of the rotor and through the pockets therein and through the various by-passes in a sinuous course. A pair of low pressure rotors 43 and 44 are keyed as at 45, to the common drive shaft 19, said rotors being disposed on opposite sides of a stationary separating member 46. A plurality of nipples 47 establish communication between the exhaust chamber 42 and the pockets of the low pressure rotor 43, said nipples being provided with enlarged outlet ends and restricted inlet ends. The low pressure rotors 43 and 44 are each provided with an annular series of radially disposed curved blades 48 defining lateral pockets 49, while the stationary member 46 is provided with reversely curved blades 50 defining lateral pockets 51. As illustrated, the pockets of the rotor 43 are substantially shorter and narrower than the pockets of the rotor 44, while the pockets of the stationary member 46 are formed in such a manner as to gradually increase in width and thickness from the end which communicates with the pockets of the rotor 43 to the end which communicates with the pockets of the rotor 44. An auxiliary high

pressure intake passage 52 is provided in each end wall, the same communicating at its intake end through a valve seat 53 with the fluid supply chamber 29 and communicating at its opposite end with a conduit 54, the outlet end of which communicates with the pockets 49 of the rotor 43 at a point diametrically opposite the intake nipples 47. A valve 55 having a stem 56 and an exteriorly disposed manipulating handle 57 is designed to coact with the seat 53, whereby manual control of the high pressure intake passage 52 is had. A rotor unit consisting of the high pressure rotor 26 and the low pressure rotors 43 and 44, is located in each compartment 13 and 14. The blades of one rotor unit are disposed oppositely to the blades of the other rotor unit whereby the actuating fluid, when subjected to one of said rotor units, will drive the common drive shaft 19 in one direction, and when cut off therefrom and subjected to the blades of the opposite unit, will drive said drive shaft in the opposite direction. Each compartment is provided with an exhaust opening 60 through which the fluid will pass from the compartment after having performed its function.

In order to provide means for driving the drive shaft 19 in opposite directions, use is made of a control valve 61 which communicates at one end with a supply pipe 62 having a cut-off valve 63. The control valve is provided with two outlet ports 64 and 65 at its opposite end, which communicate respectively with the feed pipes 66 and 67 leading to intake ports 68 and 69 of the fluid supply chambers 29 of each of the end walls. The outlet ports 64 and 65 are designed to be respectively covered or uncovered by the sliding valve members 70 and 71, the stems 72 of which are respectively connected by the links 73 to the opposite extremities of a rock arm 74 pivoted as at 75. The arrangement is such that when the rock arm 74 is actuated to uncover the port 64, the port 65 will have been previously closed prior to the opening of the port 64 or vice versa. A suitable operating lever 76 is provided for actuating the rock arm 74. Preferably each of the valve members 70 and 71 is of dove-tailed formation to fit the dove-tailed guide seats 78 and the same are provided with upstanding tubular bosses 79 which telescopically receive the depending pins 80 from a sliding guiding member 81. A coiled contractile spring 82 is interposed between the guide member 81 and the body of the valve member.

In operation, under normal conditions, the valves of the auxiliary intake ports are closed and the control valve is shifted to permit the fluid from the supply pipe 62 to enter the fluid supply chamber 29 in the end wall 15 through the port 68 and pipe 66

where it will successively act on the blades 27 of the high pressure rotor 26 as it passes in a sinuous course through the by-passes 35, 36, 35^a, 36^a, 35^b, 36^b and 35^c. After passing through the final by-pass 35^c, the fluid will enter the exhaust chamber 42, from whence it will pass through the nipples 47 and successively act on the blades 48 of the rotor 43, pass through the ports 51 of the stationary member 46 between the stationary blades 50, and thence act on the blades 48 of the rotor 44 and escape from the compartment 13 through the exhaust opening 60. Should additional speed be desired, the valves of the auxiliary intake ports will be opened to admit the high pressure from the fluid supply chamber 29 to the outlet ends of the by-passes 36, 36^a and 36^b and to admit a supply of high pressure directly to the low pressure rotors 43 and 44 through the auxiliary high pressure port 52 and conduit 54. If additional power is desired, it is only necessary to add further low pressure rotors in pairs similar to the rotors 43 and 44. Under this condition the rotor unit on the right hand side of Figure 2 will be idling and will act as a counterbalancing agent or flywheel. To reverse the motor the lever 76 is shifted to rock the arm 74, thereby closing the port 64 of the control valve and opening the port 65 to cut off the fluid from the rotor unit on the left hand side of Figure 2 and actuate the rotor unit on the right hand side of Figure 2, thus admitting fluid through the pipe 67 to the inlet port 69 of the fluid supply chamber 29 of the end wall 16. As the fluid travels through the rotor elements of this rotor unit, the reverse curve of the blades will drive the common drive shaft in a reverse direction, the rotor elements of the rotor unit of the left hand side of Figure 2 acting as a flywheel. It is, of course, understood that the control valve 61 may either be actuated by hand or governor controlled.

From the foregoing it will be seen that a comparatively simple and inexpensive turbine has been provided which can be placed on and is especially adapted for speed boats due to the fact that the same is compact and is of the reversible type. It will also be seen that the speed and power may be regulated by the auxiliary valves in order to adapt the motor for various conditions.

I claim:

1. A turbine including a plurality of rotor units mounted on a common drive shaft, a casing having independent compartments for separately housing said rotary units, each unit consisting of high and low pressure rotors, an annular high pressure fluid supply chamber surrounding the high pressure rotors of each unit, a primary intake leading from said supply chambers to the high pressure rotors, a plurality of circumferentially spaced auxiliary intakes leading

from said high pressure supply chamber to each high pressure rotor, and manually controlled means for selectively opening and closing the said auxiliary intakes.

2. A turbine including a plurality of rotor units mounted on a common drive shaft, a casing having independent compartments for separately housing said rotary units, each unit consisting of high and low pressure rotors, a high pressure supply chamber for each high pressure rotor having a plurality of intakes communicating with various points in the cycle of rotation of the rotors and exhaust from each high pressure rotor, an intake to the low pressure rotor communicating with the high pressure rotor exhaust, and means for selectively opening and closing the intakes to the high pressure rotors.

3. A turbine including a plurality of rotor units mounted on a common drive shaft, a casing having independent compartments for separately housing said rotary units, each unit consisting of high and low pressure rotors, a high pressure supply chamber for each high pressure rotor having a plurality of intakes communicating with various points in the cycle of rotation of the rotors and exhaust from each high pressure rotor, an intake to the low pressure rotor communicating with the high pressure rotor exhaust, means for selectively opening and closing the intakes to the high pressure rotors, a common feed for the supply chambers of each unit, and means for simultaneously rendering one unit active when the other is inactive.

4. A fluid turbine including a casing, a drive shaft extending axially through said casing and high and low pressure means for simultaneously actuating said drive shaft comprising a high pressure rotor secured to the drive shaft, a low pressure rotor secured to the drive shaft, an annular fluid supply chamber, an initial intake leading from the fluid supply chamber to the high-pressure rotor, an exhaust for said high pressure rotor, an intake for the low pressure rotor communicating with the high pressure exhaust, and ported means on opposite sides of said high pressure rotor for effecting an annular sinuous course of the fluid through the rotor.

5. A fluid turbine including a casing, a drive shaft extending axially through said casing and high and low pressure means for simultaneously actuating said drive shaft comprising a high pressure rotor secured to the drive shaft, a low pressure rotor secured to the drive shaft, an annular fluid supply chamber, an initial intake leading from the fluid supply chamber to the high pressure rotor, an exhaust for said high pressure rotor, an intake for the low pressure rotor communicating with the high pressure ex-

haust, and ported means on opposite sides of said high pressure rotor for effecting an annular sinuous course of the fluid through the rotor, said ported means being of gradually increasing area from the initial intake to the exhaust of the high pressure rotor.

6. A fluid turbine including a casing, a drive shaft extending axially through said casing and high and low pressure means for simultaneously actuating said drive shaft comprising a high pressure rotor secured to the drive shaft, a low pressure rotor secured to the drive shaft, an annular fluid supply chamber, an initial intake leading from the fluid supply chamber to the high pressure rotor, an exhaust for said high

pressure rotor, an intake for the low pressure rotor communicating with the high pressure exhaust, ported means on opposite sides of said high pressure rotor for effecting an annular sinuous course of the fluid through the rotor, said ported means being of gradually increasing area from the initial intake to the exhaust of the high pressure rotor, auxiliary intakes communicating with the annular fluid supply chamber and various points in the cycle of rotation of the high pressure rotor, and means for manually and selectively opening and closing said auxiliary intakes.

LOUIS DE SANTIS.