

W. ROBINSON.
TURBINE.

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945,807.

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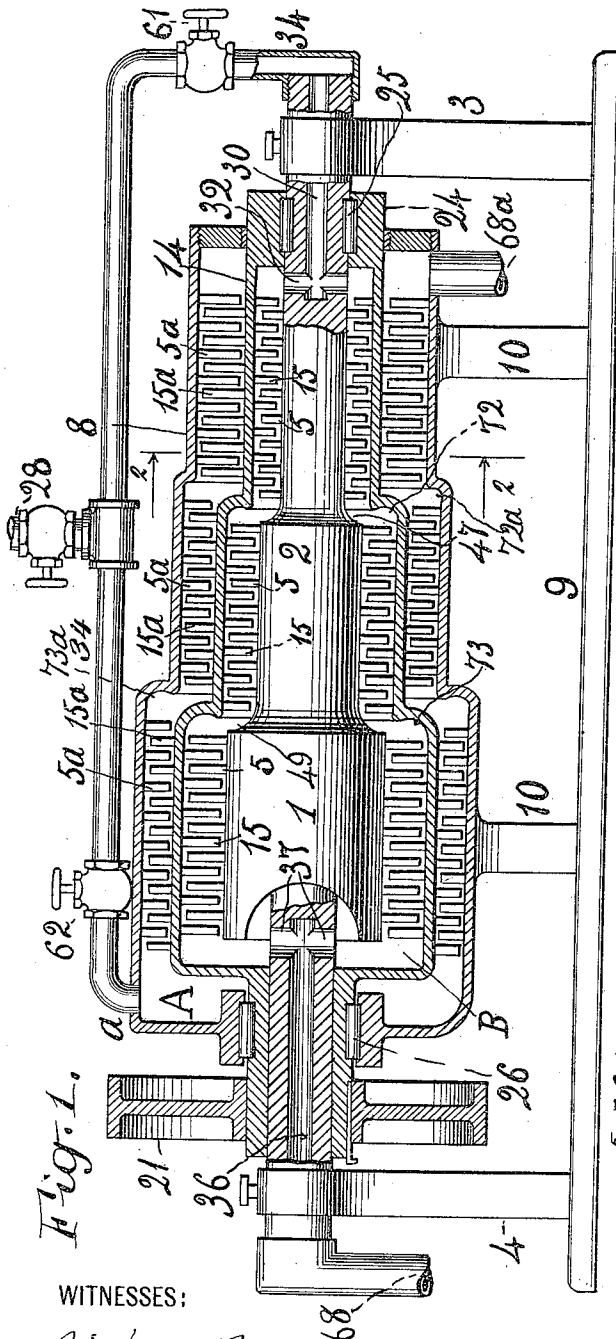


Fig. 1.

WITNESSES:

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Fig. 2.

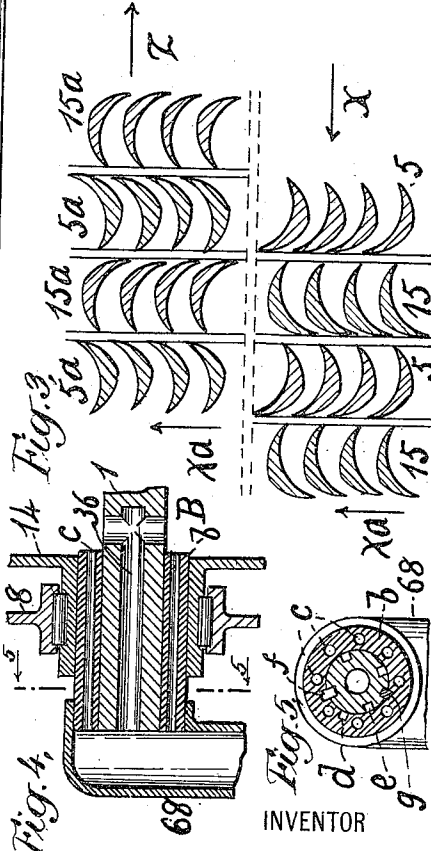
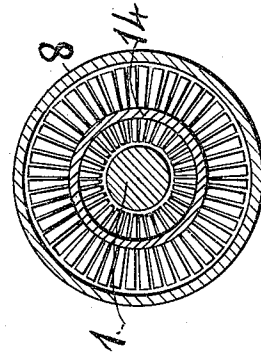


Fig. 4.

Fig. 3.

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TURBINE.

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To all whom it may concern:

Be it known that I, WILLIAM ROBINSON, a citizen of the United States, and a resident of Brooklyn, in the county of Kings and State of New York, have invented a new and Improved Turbine-Engine, of which the following is a specification.

My invention relates chiefly to improvements for increasing the driving surface and power of turbine engines, and for counterbalancing the end thrust of the rotor. It also embraces certain details of construction.

The nature of this invention will be understood from the description which follows, reference being had to the accompanying drawing, which forms a part of this specification, in which—

Figure 1 represents a longitudinal section of a turbine steam engine, illustrating this invention; Fig. 2 is a transverse section through the line 2, 2, Fig. 1; Fig. 3, below the dotted lines, illustrates in section the relative arrangement of the rings of blades or vanes in the inner chamber B of Fig. 1, and above said dotted lines the relative arrangement of the rings of blades in the outer chamber A of said Fig. 1; Fig. 4 is a view in longitudinal section illustrating an improved exhaust forming a part of this invention, and Fig. 5 is a transverse section through the line 5, 5, Fig. 4.

The fixed shaft 1, formed with the radial expansions 2 thereon, is held in a fixed non-rotatable position by the supports 3, 4 as illustrated by the clamps at C. This shaft 1 is provided with the fixed, non-rotative radial sets of blades 5, 5.

The outer shell or case 8 is also held rigidly in a fixed, non-rotatable position by being anchored to the supporting or base plate 9, as by the supports 10. Said shell 8 is provided on its interior with parallel rings of fixed blades 5^a projecting inwardly in a radial direction, as shown.

Between the fixed shaft 1 and the fixed outer shell 8 the rotor sleeve 14 is mounted rotatably, and is provided on its interior with the rings of blades 15, co-acting with the rings of blades 5, secured to said shaft 1, to drive said rotor sleeve 14. Said rotor sleeve is provided on its exterior with rings

of blades 15^a coacting with the fixed rings of blades 5^a also to drive said rotor.

The blades in the outer chamber A are intended to drive the rotor 14 in the same direction as the blades in the inner chamber B, that is, the blades in the two chambers A and B in operation reinforce each other to drive the rotor 14 in the same direction. This requires a peculiar arrangement of blades, as illustrated in Fig. 3, in which, it will be noted, the rings of fixed blades 5 in the inner chamber B and 5^a in the outer chamber A are oppositely inclined in a direction to deflect the steam impinging upon their respective concave surfaces in opposite directions against the concave surfaces of the respective rings of rotatable blades 15 and 15^a, thus causing the blades in the chambers A and B to reinforce each other in driving the rotor forward in the direction of the arrow α .

The operation is as follows: When the valve 61 is opened in the steam supply pipe 34 the steam enters the inner chamber B through the orifice 20 and the ports 32 in the shaft 1, and thence passes through the length of said chamber in the direction of the arrow α , imparting rotary motion to the rotor 14, and passes out at the exhaust 68 at the opposite end of the machine. The supply pipe 34 is connected also to the outer chamber A at said opposite end of the engine, as shown at α , and when the valve 62 in said steam supply pipe is opened the steam passes into the outer chamber A at α , and traverses the length of said chamber in the direction of the arrow α to the exhaust 68^a at the opposite end of the machine from α . The live steam, entering the chamber B at 30 and passing therethrough, impinges upon the fixed rows of blades 5, passes through between the same and reacts upon the parallel rotating rings of blades 15 secured to the interior of the rotor sleeve 14, thus rotating the latter in the direction indicated by the arrow α . The live steam admitted to the outer chamber A impinges upon the fixed rows of blades 5^a secured to the outer shell 8, passes through between the same and reacts upon the rotating rings of blades 15^a secured to the exterior of said

rotor sleeve 14, thus imparting to said rotor additional power from live steam to drive said rotor forward in the direction of the arrow z^a . Thus, it will be understood, the live steam in each chamber reinforces that in the other chamber to drive the rotor in the same direction. The steam in passing through the inner chamber B in the direction of the arrow z has a tendency, by its pressure against the diagonal surface of the rotating blades, to impart to the rotor 14 an end thrust in the same direction. On the contrary, the steam in passing through the outer chamber A in the reverse direction, acting upon the rotor blades 15^a tends to impart an end thrust to said rotor in the direction of the arrow z , thus tending to counterbalance the end thrust in the opposite direction caused by the steam passing through the inner chamber B, as described. It is pointed out also that the steam in passing through the inner chamber B in the direction of the arrow z and striking against the expanding annular shoulders on the shaft at 47, 49, reacts against the annular shoulders 72, 73 on the interior of the rotor, thus tending to give the same an end thrust in the direction of the arrow z . On the contrary, the steam, in passing through the outer chamber A in the reverse direction, strikes against the annular shoulders 73^a, 72^a, on the interior of the shell or case 8, and reacts against the exterior of the annular expansions of the rotor, as shown at 73, 72, thus tending to give the rotor 14 an end thrust in the direction of the arrow z . Thus it is evident that the result of the end thrusts in opposite directions upon the rotor is to neutralize the effect of said end thrusts and to give the rotor a steady uniform rotation without end thrusts when the driving force is equalized in the two chambers.

From the foregoing it is apparent that the end thrust upon the rotor caused by steam passing through one chamber in one direction is counteracted by the end thrust caused by steam passing through the other chamber in the opposite direction.

The blades in the outer chamber A are farther from the center of the engine than those in the inner chamber; the increased leverage and consequent power exerted by the steam in the outer chamber, therefore, is correspondingly greater than that in the inner chamber. Furthermore, since there is much more space in the outer than in the inner chamber the number and superficial surface of the blades in the outer chamber are correspondingly increased. In view of the above, therefore, it is estimated that the power developed by live steam under normal pressure in the outer chamber is at least twice as great as that in the inner chamber;

that is, that a turbine engine of this construction will develop a power at least three times as great as a turbine of a similar type but of usual construction occupying a similar floor space.

In using this engine it is evident that a perfect balance of the end thrusts exerted in opposite directions upon the rotor is readily obtained by equalizing the driving pressure in the inner and outer chambers, but when greater power is required this may readily be obtained by admitting a greater pressure of steam to the outer chamber.

It will be observed that when the valves 61 and 62 are both open the valve 28 in the main steam pipe will control the admission of steam to both the chambers A and B simultaneously, whereas, if 28 and 62 be open and 61 closed steam will be admitted to the outer chamber A but shut off from the inner chamber B; conversely, by opening the valve 61 and closing 62 steam will be admitted to the inner chamber B and shut off from the outer chamber A.

It is evident that the valves 61 and 62 may be so adjusted as to admit exactly or approximately the same driving pressure in each chamber A and B, thus perfectly balancing and neutralizing the end thrusts tending to occur in opposite directions on opposite sides of the rotor. For convenience in ordinary operation this adjustment may then be left undisturbed, if desired, and the admission of steam to both chambers be controlled by the single valve 28. Thus steam or other operative power may be utilized in both driving chambers simultaneously, or in either chamber independently of the other.

The exhaust 36, through the shaft 1, is hardly large enough to give best results. I therefore secure the bearing sleeve b around said shaft, as shown in Figs. 4 and 5. This sleeve is provided with a number of perforations c extending from the inner chamber B to the exhaust 68, through which the exhaust steam may pass. I also show longitudinal channels d on the inside of said sleeve, and channels e on the outside of said shaft. f shows coinciding channels in both the sleeve and shaft, together forming a channel of double area. All of the channels and orifices described are longitudinal and extend from the inner working chamber B to the external exhaust 68, and in the aggregate furnish ample means for conveying the spent steam from said chamber B to said external exhaust. The various orifices and channels described may be used separately or in any combination found most advantageous or convenient. The sleeve b is shown as secured to the shaft 1 by the key g . I do not limit myself to the use of steam

in carrying out this invention, but may use any suitable source of power and still be within the spirit, scope and purpose of my invention.

5 Having thus described my invention what I claim as new and desire to secure by Letters Patent, is:

1. A turbine engine comprising a shaft and an outer shell or case, each provided with non-rotating blades or buckets, means for anchoring said shaft in a fixed, non-rotatable position, a rotor sleeve supported rotatably between said shaft and shell and provided on its inner and outer surfaces with blades or buckets arranged to coact with said stationary blades or buckets to drive said rotor sleeve, and means for causing live steam or operative fluid to pass through said engine in opposite directions on opposite sides of said rotor sleeve, said live steam or operative fluid operating to drive said engine.

2. A turbine engine comprising a shaft and an outer shell or case, each provided with non-rotating blades or buckets, a rotor sleeve supported rotatably between said shaft and shell and provided on its inner and outer surfaces with blades or buckets arranged to coact with said stationary blades and buckets to rotate said rotor sleeve, and means for passing steam or operative fluid through said engine on either side of said rotor sleeve independently of the other, said steam or operative fluid flowing in opposite directions on opposite sides of said rotor sleeve, and causing the latter to rotate.

3. A turbine engine comprising a shaft and an outer shell or case, each provided with non-rotating blades or buckets, means for securing said shaft in a non-rotatable position, a rotor sleeve supported rotatably between said shaft and shell, and provided on its inner and outer surfaces with blades or buckets arranged to coact with the respective stationary blades or buckets on said shaft and shell to drive said rotor in the same direction, and means for causing steam or operative fluid to traverse said engine in opposite directions on opposite sides of said rotor sleeve, said steam exerting force operatively on both sides of said rotor sleeve to rotate it in the same direction.

4. In a turbine engine, the combination of a fixed shaft provided with non-rotating blades or buckets, a fixed outer case or shell also provided with non-rotating blades or buckets, a rotor sleeve or cylinder provided on its interior and exterior surfaces with blades or buckets, and supported rotatably between said fixed shaft and shell and forming independent chambers between said shaft and rotor and between said rotor and outer shell, the blades in each of said chambers

coacting to drive said rotor in the same direction, and means for passing steam or operative fluid through both of said chambers simultaneously in opposite directions.

5. In a turbine engine, the combination of a fixed shaft provided with non-rotating blades or buckets, a fixed outer case or shell also provided with non-rotating blades or buckets, a rotor sleeve or cylinder provided on its interior and exterior surfaces with blades or buckets, and supported rotatably between said fixed shaft and shell and forming independent chambers between said shaft and rotor and between said rotor and outer shell, the blades in each of said chambers co-acting to drive said rotor in the same direction on the admission of steam or operative fluid to either of said chambers, and means for causing steam to traverse either of said chambers independently of the other, or both chambers simultaneously in opposite directions.

6. A turbine engine comprising a shaft and an outer case or shell, both fixed in non-rotatable position, and each provided with non-rotating blades or buckets, a rotor sleeve supported rotatably between said shaft and case, and provided on its inner and outer surfaces with blades arranged to co-act with said stationary blades or buckets to drive said rotor, said rotor forming working chambers of approximately equal length between said shaft and rotor and between said rotor and outer shell or case, and means for causing steam or operative fluid to pass through said engine in opposite directions on opposite sides of said rotor, said steam or operative fluid operating to drive said engine.

7. In a turbine engine comprising a rotor and a stator forming a working chamber between the same, one of said elements comprising a central shaft or member provided at its end with eccentrically arranged longitudinal passages extending from said working chamber and arranged to convey the exhaust steam or fluid therefrom.

8. In a turbine engine comprising a concentrically arranged rotor and stator forming a working chamber between the same, one of said elements comprising a central shaft or member, the combination therewith of a support for the end of said central shaft or member, said support being provided with longitudinal passages extending outwardly from said working chamber and arranged to convey exhaust steam or fluid therefrom.

9. A turbine engine comprising the following elements: a rotor and a stator forming a working chamber between the same, one of said elements comprising a central shaft or member provided at its end with a

longitudinal central orifice, a sleeve or bearing surrounding the end of said shaft or member and provided with longitudinal passages extending from said working chamber
5 outwardly, said orifice and passages being arranged to convey the exhaust steam or fluid from said working chamber.

10 10. In a turbine engine, the combination with the central shaft or member having at its end a longitudinal central orifice, of a sleeve or bearing surrounding the end of

said shaft, and provided with longitudinal passages extending from the working chamber of said engine to its exterior, all of said passages being arranged to convey the exhaust steam or fluid from said working chamber of the engine. 15

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Witnesses:

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