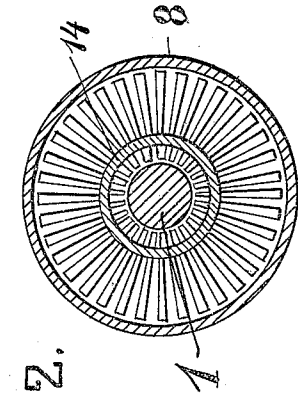
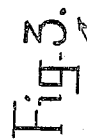


APPLICATION FILED APR. 19, 1909.

Patented Jan. 11, 1910.



25



L. Hauerstein
Harry Goss,

Wm. Robinson.

UNITED STATES PATENT OFFICE.

WILLIAM ROBINSON, OF BROOKLYN, NEW YORK.

TURBINE.

945,808.

Specification of Letters Patent.

Patented Jan. 11, 1910.

Original application filed April 13, 1908, Serial No. 426,693. Divided and this application filed April 19, 1909. Serial No. 491,168.

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.

This case is a division of my application for a patent for a turbine engine, filed April 13, 1908, Serial No. 426,693.

My invention relates to means for increasing the driving surface of turbine engines, means for utilizing the exhaust steam in compounding the engines, in means for counterbalancing the end thrust of the rotor and to other improvements.

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 cross section through the line y, y Fig. 1, and 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 illustrates, above said dotted lines, the relative arrangement of the rings of blades in the outer chamber A of Fig. 1.

The fixed shaft 1, provided with the sleeve or radial expansion 2 shrunk thereon, or otherwise rigidly secured thereto, is held in a fixed, non-rotative position by the supports 3, 4. The shaft 1 is provided also with the fixed, non-rotative radial sets of blades 5, 6, 7. 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. The fixed outer 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, 16, 17, coacting with the rings of blades 5, 6, 7, secured to the shaft 1, to drive said rotor sleeve 14. Said rotor sleeve 14 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 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 this case the steam enters the inner chamber B from the steam pipe 34, through the orifice 30 in the shaft 1, at the front end of the machine, and, passing through said chamber in the direction of the arrow x returns in the reverse direction through the outer chamber A, as indicated by the arrow z . The steam, entering the chamber B impinges upon the fixed rows of blades 5, 6, 7, passes through between the same and reacts upon the rotating rings of blades 15, 16, 17, secured to the rotor sleeve, thus driving the latter in the direction illustrated by the arrow x^a . The steam then passes through the ports 69 into the outer chamber A, in the direction of the curving arrow z^a . It then strikes the rows of fixed blades 5^a, and reacts against the rotating rings of blades 15^a secured to the exterior of the rotor 14, thus exerting its force, in the outer chamber A, a second time to drive the rotor in the direction of the arrow x^a . Thus the steam passes from the supply pipe through both chambers A, B to the exhaust 68^a at the entrance end of the machine. Thus, by passing the steam twice through the engine, on opposite sides of the rotor we double the compounding of the engine and utilize the steam, it is believed, to a much greater degree of exhaustion than has heretofore been done. The steam, in passing through the various stages of this machine, of course gradually expands and deteriorates in force, and I therefore give to each succeeding stage of blades a greater superficial surface than that of the preceding stage, because of the said expansion and consequent diminishing power of the steam. Thus the superficial surface of the blades in the stage E is considerably greater than in the stage D, and greater in F than in E, and in H, in the outer chamber, than in F, and greater in I than in H, and in K than in I. Thus we have a simple sextuple compound

turbine engine utilizing the expanding steam through its different stages, as long as it is of any substantial economic value.

Fig. 2 illustrates, approximately, the difference between the superficial surface of the blades in the first stage D, through which the live steam enters the machine, and the last stage K from which the fully expanded steam makes its exit through the exhaust.

It is here pointed out, as illustrated in Fig. 3, that 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 *a*. The steam in passing through the inner chamber B, in the direction of the arrow *w*, has a tendency, by its pressure against the rotating blades, to give 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, as indicated by the arrow *z*, tends to give the rotor an end thrust in the direction of said arrow *z*, thus tending to counterbalance the end thrust in the opposite direction caused by the steam passing through the inner chamber, as described. It is pointed out also that the steam in passing through the inner chamber B in the direction of the arrow *w*, in 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 *w*. 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.

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.

It will be understood that the pulley 21, keyed to the rotor sleeve 14, illustrates means for transferring driving power from said rotor sleeve and engine to the machinery to be driven thereby.

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.

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

1. A turbine engine comprising a central shaft and an outer case or shell, both fixed in a non-rotatable position and each provided with non-rotating blades or buckets, a rotor sleeve supported rotatably between said fixed shaft and case and rotating around said fixed shaft, said sleeve being provided on its inner and outer surfaces with blades or buckets arranged to coact 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 case or shell, and means for causing steam or operative fluid to pass through one of said working chambers in one direction and to return through the other working chamber in the opposite direction, on the opposite side of said rotor, the steam or operative fluid in each chamber operating to drive said rotor in the same direction.

2. In a turbine engine, the combination of a fixed shaft provided with non-rotating blades or buckets, means for securing said shaft in a fixed, non-rotatable position, a fixed outer case or shell also provided with non-rotating blades or buckets, a rotor sleeve or cylinder provided on its inner and outer surfaces with blades or buckets, said sleeve being supported rotatably between said fixed shaft and shell and arranged to rotate around said shaft, said sleeve forming independent working 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 causing steam or operative fluid to pass through one of said chambers in one direction and to return through the other chamber in the reverse direction, and means for connecting said rotor sleeve to the mechanism to be driven.

3. In a turbine engine, the combination of a fixed central shaft provided with a longitudinal passage way at one end and ports extending outwardly therefrom through the walls of said shaft to the inner working or blade chamber, means for securing said shaft in a non-rotatable position, an outer fixed shell or case, an independent rotor sleeve rotatably supported at a plurality of points between said shaft and shell, said sleeve forming an inner working chamber between said fixed shaft and sleeve and an outer working chamber between said sleeve and outer shell, coacting blades in each of said chambers arranged to drive said sleeve

in the same direction, a supply pipe connected to the hollow passage way in said shaft, a valve arranged to control the supply of steam or operative fluid to said inner chamber, and means for causing said operative fluid to pass through the length of said inner chamber and to return through said outer chamber to the exhaust, the operative fluid passing through each chamber reinforcing the power and efficiency developed by it in the other chamber.

4. In a turbine engine, the combination of a central shaft provided with fixed blades or buckets, means for securing said shaft in a fixed, non-rotatable position, a fixed outer case or shell also provided with non-rotatable blades or buckets, a rotor sleeve or cylinder supported rotatably between said fixed shaft and shell and arranged to rotate freely around said fixed shaft on bearings located at or near its ends, said rotor sleeve being provided on its inner and outer surfaces with blades or buckets, and forming independent working chambers on opposite sides of said rotor, the blades in each of said chambers coacting to drive said rotor sleeve in the same direction on the admission of steam or other motive power thereto, means for passing steam or motive power through one of said working chambers in one direction and returning the same through the other chamber in the reverse direction on

opposite sides of said rotor sleeve, and means for connecting said rotor sleeve to the machinery to be driven by said engine. 35

5. In a turbine engine comprising a fixed non-rotatable central shaft provided with stationary blades or buckets, means for securing said shaft in a non-rotatable position, a fixed outer case or shell, a rotor sleeve or cylinder supported rotatably between said non-rotatable shaft and shell on a plurality of bearings, said rotor sleeve forming independent working chambers between said shaft and sleeve and between said sleeve and outer shell, coacting blades in each of said chambers arranged to drive the rotor in the same direction on the admission of steam or motive power to either of said chambers, means for passing steam or motive power through one of said chambers in one direction and returning it through the other chamber in the opposite direction, and means for causing the end thrust imparted to the rotor in one chamber to be counteracted by the end thrust in the opposite direction imparted to the rotor in the other chamber, and means for connecting said rotor sleeve to the mechanism to be driven. 40 45 50 55

WILLIAM ROBINSON.

Witnesses:

E. M. HALLETT,
GEORGE F. EBERT.