

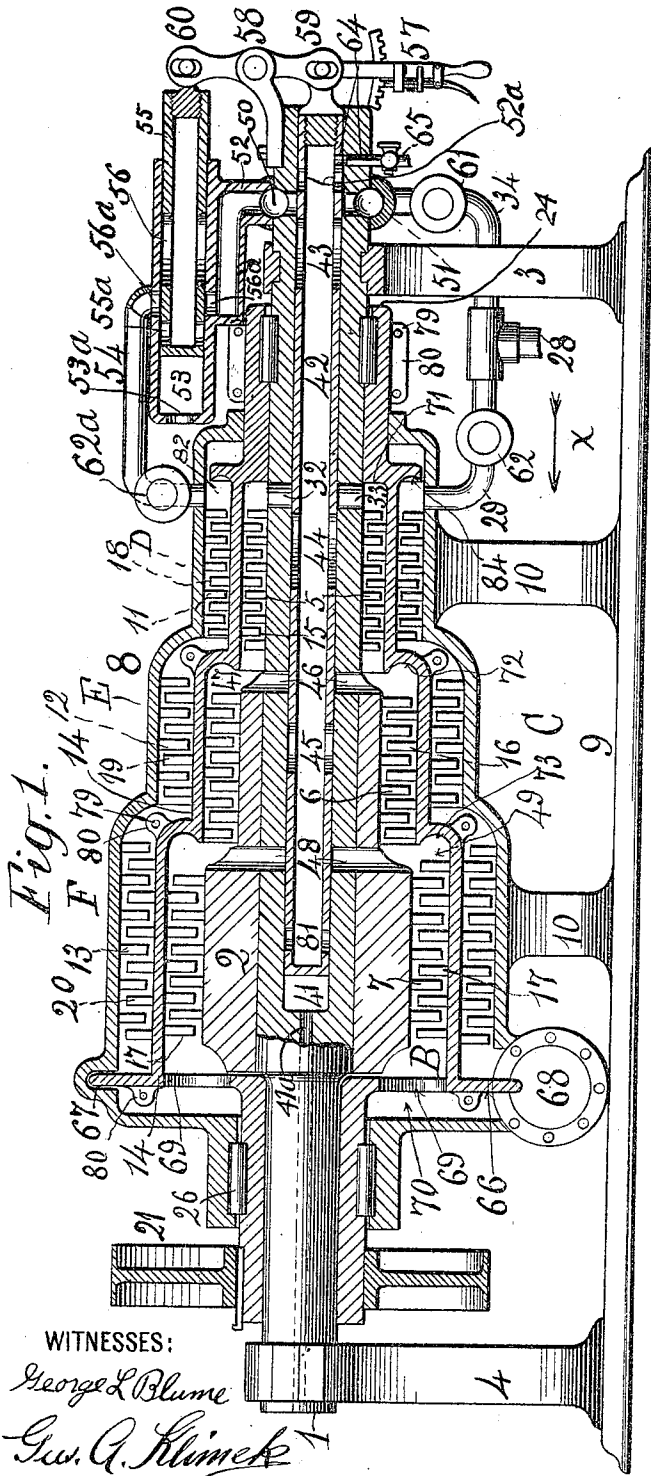
W. ROBINSON.
TURBINE.

APPLICATION FILED APR. 13, 1908. RENEWED NOV. 16, 1909.

945,811.

Patented Jan. 11, 1910.

2 SHEETS—SHEET 1.



WITNESSES:
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Fig. 2.

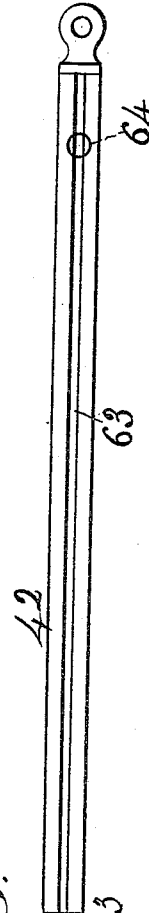


Fig. 3.

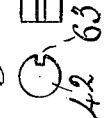
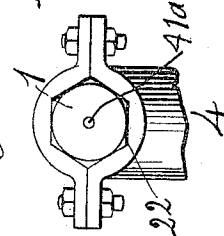


Fig. 4.



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2 SHEETS—SHEET 2.

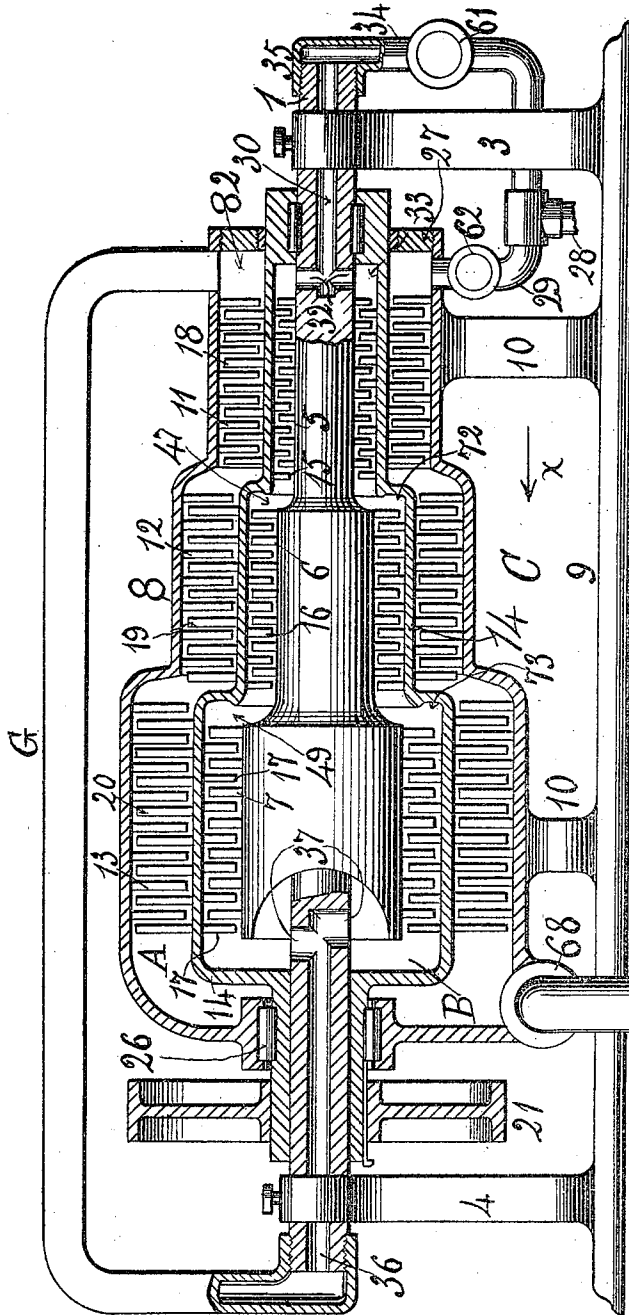


Fig. 5.

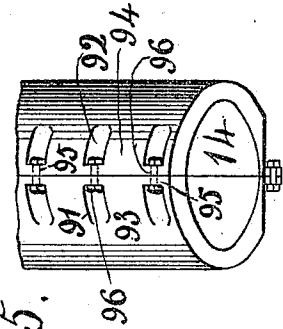


Fig. 7.

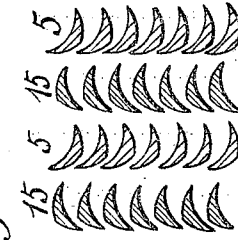
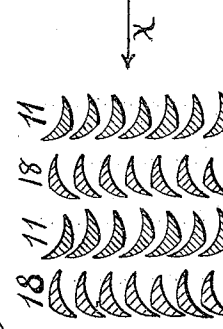


Fig. 8.



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945,811.

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To all whom it may concern:

Be it known that I, WILLIAM ROBINSON, mechanical engineer, a citizen of the United States, residing in 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 to means for increasing the driving surface of turbine engines, especially of the class described in my allowed applications filed December 6, 1904, Serial No. 235,657; and Serial No. 252,626, filed March 29, 1905.

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

Figure 1 represents a longitudinal section of a turbine steam engine, illustrating one form of my invention; Fig. 2 is a longitudinal view of the principal steam valve and Fig. 3 an end view of the same; Fig. 4 is an end view showing means for supporting and anchoring the fixed shaft; Fig. 5 is a perspective view illustrating means for securing the rotor sections together; Fig. 6 represents a longitudinal section illustrating another form of my invention; Fig. 7 illustrates the relative arrangement of the rings of vanes or blades in the inner chamber, between the rotor sleeve and the fixed shaft in Figs. 1 and 6, and Fig. 8 shows an identical relative arrangement of the rings of vanes in the outer chamber of said Figs. 1 and 6, between the rotor sleeve and the fixed outer shell or case.

It will be noted that the relative arrangement of the fixed and rotating rings of blades is identical in the inner and in the outer chambers of Figs. 1 and 6, as illustrated in Figs. 8 and 7.

The fixed shaft 1, provided with the sleeve or radial extension 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 radial sets of blades 5, 6, 7. The outer shell 8 is also rigidly held in a fixed non-rotatable position by being anchored to the supporting or base plate 9, as by the supports 10, 10. The fixed outer shell 8 is provided on its interior with parallel rings of fixed blades 11, 12, 13, projecting inwardly in a radial direction, as shown. Between the fixed shaft 1 and the fixed outer shell 8, the

sleeve 14 is mounted rotatably and is capable of rotating on its bearings in either direction. Said sleeve 14 is provided on its interior with parallel rings of blades 15, 16, 17, fixed to said sleeve and projecting inwardly in a radial direction. These rings of blades project inwardly between the fixed rings of blades 5, 6, 7, and coact therewith. In like manner the rotating sleeve 14 is provided on its exterior with radial rings of blades 18, 19, 20, (Figs. 1 and 6) projecting outwardly between the fixed rings of blades 11, 12, 13, of the outer fixed shell 8, and coacting with said fixed blades of said shell.

The operation represented in Figs. 1 and 6 will be understood on reference to Figs. 7 and 8. Assume that Fig. 8, for instance, illustrates the arrangement of blades in the outer chamber A: the first and third rows of blades, from the right, marked 11, represent the fixed blades secured on the interior of the outer shell 8, while the second and fourth rows, marked 18, represent the outer rings of blades, on the rotating sleeve 14. Assume now that the steam is admitted from the right, in the direction of the arrow X, it strikes the first ring of fixed blades, 11, reacts, passes between the blades, impinges upon the rotatable blades of the second row, 18, and so continues throughout the length of the chamber A, reacting from the fixed blades and impinging upon the succeeding rows of rotating blades. This sets the sleeve 14 in rapid rotation to the right, looking from the right hand end of the engine. Fig. 7 represents the arrangement of blades in the inner chamber B, between the fixed shaft 1 and the rotor sleeve 14. In this case the relative curves of the fixed and rotating blades are identical with the arrangement shown in Fig. 8, as already indicated; thus in Fig. 7 the first and third rows curving downwardly represent the fixed blades 5, 5, and the second and fourth rows curving upwardly represent the rotating blades 15. Now admitting steam to Fig. 7, that is, to the inner chamber B, from the right, in the direction of the arrow X, it strikes the fixed blades 5, reacts, passes through between said blades, impinges upon the rotating blades 15, and thus sets the sleeve 14, rotating to the right, looking from the right hand end of the engine. Thus, as will be seen, the engine is caused to rotate in the same direction whether steam is admitted to the outer operative chamber A, or to the inner operative

chamber B, and when live steam is admitted to both chambers simultaneously the power of the machine is very much more than double what it is when steam or operative fluid is admitted to the inner chamber alone, for instance, because of the greater leverage and blade surface secured in applying power in the outer chamber.

Referring now specifically to Fig. 1: In this figure the fixed shaft 1 is provided with the longitudinal orifice or chamber 41, in which is located the hollow or tubular valve 42. This valve is closed at both ends to balance the pressure of steam therein, and is provided at proper intervals with slots or orifices 43, 44, 45, and 81, passing through opposite sides of said valve.

As already described, openings, 32, pass from the center of the hollow shaft 1 to the annular recess 33 of the chamber B. In Fig. 1, in like manner, openings 46 pass through said shaft to the annular recess 47 of the chamber B, and openings 48 to the annular recess, 49 of said chamber B. An annular groove is formed around the shaft 1 as shown at 50 and a corresponding inner groove in the ring 51 which passes around and is secured to the shaft over said annular groove 50 thereon. The branch steam pipe 34 is secured to said ring 51, thus forming a passage for steam around said shaft. The tube 52 is secured to said ring 51 at the opposite side of said shaft, and this expands into the chamber or shell 53, from which the steam pipe 54 leads to the annular recess 82, in the chamber A. The hollow valve 55, provided with the slots or openings 56, fits closely within the chamber 53. The lever 57 is fulcrumed at 58 and engages the hollow valves 42 and 55 at opposite sides of the fulcrum as shown at 59 and 60.

The machine is now ready for operation. Opening the stop cock 61, permits the steam to pass around the annular channel 50, of the shaft 1, and to enter the tube 52, but it can go no farther as all ports are closed by the hollow valves. Now drawing out the valve 42 one space, by the lever 57, brings the open passage 43 opposite the passage 50, surrounding the shaft, and at the same time brings the open passage 44 of said valve opposite the port 32, thus admitting live steam at high pressure to the first stage D of the inner chamber B, thus starting the sleeve 14, to revolve toward the right. At the same time the inward movement of the opposite end of the lever 57 pushes the valve 55 inwardly, thus bringing the ports 56 in said valve opposite the ports 56^a in the walls of the shell 53, thus admitting live steam from the tube 52 through said valve and the pipe or passage 54 to the beginning of the outer chamber A at 82. Thus live steam is admitted simultaneously into both chambers A and B, the steam in each chamber reinforcing

ing that in the other to drive the rotor in the same direction. The steam passes through the whole length of said chamber A and B, reacting from one set of fixed blades to the next row of rotating blades throughout its passage. Thence it passes from each chamber to the exhaust, as shown at 68, and thence to the condenser or elsewhere. If now the machine be overloaded the drawing out of the valve 42 another space brings the valve opening 45 opposite the ports 46, thus admitting high pressure steam to the second stage E of the chamber B. In like manner by drawing out the valve 42 another space, steam at high pressure is admitted through the ports 48 and 81 to the third stage of the chamber B. By the simple means described, therefore, the normal power of the inner chamber B of the machine may be more than doubled if occasion requires it. During this process it will be noted, steam it still passing into the outer chamber A through the ports 56 and 56^a, as described. If it be desired to admit steam into the outer chamber A alone, without utilizing the inner chamber, it is only necessary to move the handle of the lever 57 one space to the left from the neutral position. This pushes the valve 42 inwardly and draws the valve 55 outwardly, each one space, thus bringing the ports 52^a of the valve 42 opposite the tube 52, and the ports 55^a of the valve 55 opposite the ports 56^a. Thus, as inspection will show, all ports to the inner chamber are closed by the valve 42, while the ports leading to the outer chamber alone are open. It will be understood also, that with the valve 61 closed, the valve 62 may be opened, thus admitting steam to the outer chamber A through the pipe 29, without admitting it to the inner chamber B. On the contrary, by opening the valve 61 and closing the valves 62 and 62^a the lever 57 will control the admission of steam to the inner chamber only, the outer chamber remaining without steam. Again, by leaving the valve 61 open and the valve 62^a closed, the lever 57 will control the admission of steam to the inner chamber B only, while the valve 62 may be utilized to admit more or less steam to the outer chamber A as desired.

From the foregoing it will be understood that this machine may be used either as a single or a double engine, and with varying steam pressure in the different chambers A, B. Furthermore, the disabling of the mechanism in, or connected with, one chamber does not necessarily affect the independent operation of the other.

It is evident that by closing the ends of the hollow valve 42 and making the respective slots or orifices 43, 44, 45, 81, in its walls opposite each other, the steam within said valve exerts an equal pressure in all directions, that is, the valve is perfectly balanced, and, as a consequence, it may be read-

ily actuated and controlled by the lever 57 without any resistance from the steam pressure within said valve. A vent hole 41^a is made between the shaft chamber 41 and the outer air, preferably through the end of the shaft 1, as shown. This prevents the formation of a compressed air cushion in the unoccupied space in the chamber 41, which might thus resist the free movement of the valve 42. This vent hole 41^a may approximate in diameter the diameter of the chamber 41, thus aiding also in the cooling of the shaft 1. In like manner, and for the same purpose, the valve 55 has both ends closed, while the shell 53 in which it moves is provided with a vent 53^a. I make a longitudinal channel 63 in the bottom of the valve 42, between the valve and its seat, for the purpose of drainage. Near the outer end of said valve I make an orifice 64, extending through the fixed shaft and the wall of said valve when the machine is in its normal inert condition, as shown in Fig. 1. In this orifice in the shaft a drainage cock 65 is inserted, which may be opened or closed at pleasure. It will be noted that these orifices 64 are opposite each other only when the valve 42 is in its normal position and the machine inert. The movement of the valve closes the orifice in the shaft. At the opposite end of the machine the rotor sleeve 14 is provided with an annular outwardly extending web or flange, 66, extending into an annular recess 67, in the outer case 8, and its edge projecting into the general exhaust port, 68, as shown. The spent steam from the outer chamber A is directed by said flange directly to said exhaust port 68. The spent steam from the inner chamber B passes through the orifices 69 into the annular chamber 70 and from there is directed in like manner by said flange 66 into said exhaust port 68, from which it passes to the condenser, or elsewhere. By thus keeping the two bodies of spent steam from the chambers A and B separated until they pass practically outside of the machine, the liability of the exhaust steam from one of the chambers A, B, exerting back pressure upon the blades of the other chamber is practically eliminated.

Referring now to Fig. 6. As already described the relative arrangement of the fixed and rotating rings of blades in the inner and outer chambers B and A in this figure are the same as described in connection with Fig. 1, and illustrated in Figs. 7 and 8. This part of the invention therefore need not be here further described. As illustrated in this figure, on opening the valve 61 the steam passes through the pipe 34, the orifice 30 in the shaft 1, and the ports 32 into the recesses 33 of the inner chamber B, thence through the inner chamber, setting the rotor in motion. After thus passing

through the inner chamber the steam reenters the shaft 1 at its opposite end, through the ports 37, and passes thence through the orifice 36 in the shaft and returns by the pipe G to the recess 82 at the front end of the outer chamber A; thence the partially exhausted steam passes through the whole length of the outer chamber A to the exhaust 68, thence to the condenser or elsewhere. It will be observed that owing to the greater distance of the outer chamber from the shaft the size and number of the blades in the outer chamber present a progressively greater surface to the partially exhausted steam than in the inner chamber. 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 rotor sleeve 14, is made, in this case, in two longitudinal sections for convenience in constructing and assembling and these sections are secured together by bolts, as illustrated in Fig. 5, or in any suitable manner. In like manner the sections of the outer shell or case 8 are bolted or secured together in any well known or suitable manner.

I do not limit myself to the use of steam in carrying out this invention, but may use any suitable source of power without departing from the spirit and purpose of my invention.

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

1. In a turbine engine, a rotor consisting of a hollow cylinder or sleeve provided on its inside and its outside with operative vanes or blades arranged to drive said cylinder or sleeve in the same direction, on the application of steam or operative pressure to the blades on either surface of said rotor independently of those on the other surface.

2. In a turbine engine, a cylindrical or hollow rotor provided on both its interior and its exterior surfaces with sets of vanes or blades having their surfaces so inclined relatively to each other that operative pressure exerted upon the blades secured to either the interior or the exterior of said rotor will operate to drive said rotor in the same direction, and means for applying power independently to either side of said rotor.

3. In a turbine engine, the combination of a fixed shaft provided with fixed blades or buckets, a fixed outer case or shell, a rotor cylinder or sleeve supported rotatably between said shaft and shell, and forming independent chambers between said shaft and sleeve and between said sleeve and outer shell, coacting blades in each of said chambers, the blades in each chamber being arranged to drive the rotor sleeve in the same

direction, on the admission of steam or operative fluid thereto, and means for admitting motive power to either chamber independently of the other.

- 5 4. In a turbine engine, the combination of
a fixed shaft provided with outwardly extending fixed blades, a fixed outer case or
shell, a rotor cylinder or sleeve supported
rotatably between said shaft and shell, and
10 forming independent chambers between said
shaft and sleeve and between said sleeve and
outer shell, coacting blades in each of said
chambers, and means for passing steam or
operative fluid through both of said cham-
15 bers simultaneously on opposite sides of said
rotor, the operative fluid in each chamber
reinforcing that in the other chamber to
drive the rotor in the same direction.
5. In a turbine engine, the combination of
20 a fixed central shaft or member provided
with outwardly extending rings of fixed
blades, a fixed outer case or shell provided
with inwardly projecting rings of blades,
a rotor sleeve or cylinder mounted rotatably
25 between said shaft and shell and forming
independent chambers between said shaft
and rotor and between said rotor and outer
shell, said rotor being provided on its exterior
with a series of blades arranged to coact
30 with the blades secured to said outer shell,
and on its interior with blades arranged to
coact with the blades secured to said fixed
shaft, all of said coacting blades in the two
chambers operating to drive said rotor
35 sleeve in one direction, and means for admitting
steam or operating fluid to both of
said chambers, said fluid flowing through
both of said chambers in the same direction.
6. In a turbine engine, the combination of
40 a fixed shaft provided with outwardly extending
fixed blades or buckets, a fixed outer case
or shell provided with inwardly projecting
blades or buckets, a rotor sleeve

or cylinder mounted rotatably between said
shaft and shell and forming independent 45
chambers between said shaft and rotor and
between said rotor and outer shell, said rotor
being provided on its exterior with a series
of blades or buckets arranged to coact with
the blades secured to said outer shell, and 50
on its interior with blades arranged to coact
with the blades secured to said fixed shaft,
all of said coacting blades or buckets in the
two chambers operating to drive said rotor
sleeve in one direction, and means for ad- 55
mitting steam or other operating fluid to
both of said chambers simultaneously.

7. In a turbine engine, the combination of
a central fixed, hollow shaft or member provided
with a longitudinal tubular chamber 60
with ports extending from said tubular
chamber outwardly through said shaft to
the inner working or blade chamber, an
outer fixed shell or case, a sleeve rotatably
supported between said shaft and shell, said 65
sleeve forming, respectively, an inner working
chamber between said 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 70
sleeve in the same direction, a supply pipe
connected to said outer chamber and to said
hollow shaft, a valve arranged to control the
supply of working fluid to said inner
chamber, a valve arranged to control the 75
supply of working fluid to said outer chamber,
and a controlling lever, the whole arranged
so that steam or other motive fluid may be
admitted to either of said chambers separately,
or to both simultaneously, by the 80
movement of said lever.

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Witnesses:

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