E. FISHER, Jr.

TURBINE.

APPLICATION FILED JULY 16, 1910.

988,990.

Patented Apr. 11, 1911.

3 SHEETS—SHEET 1.

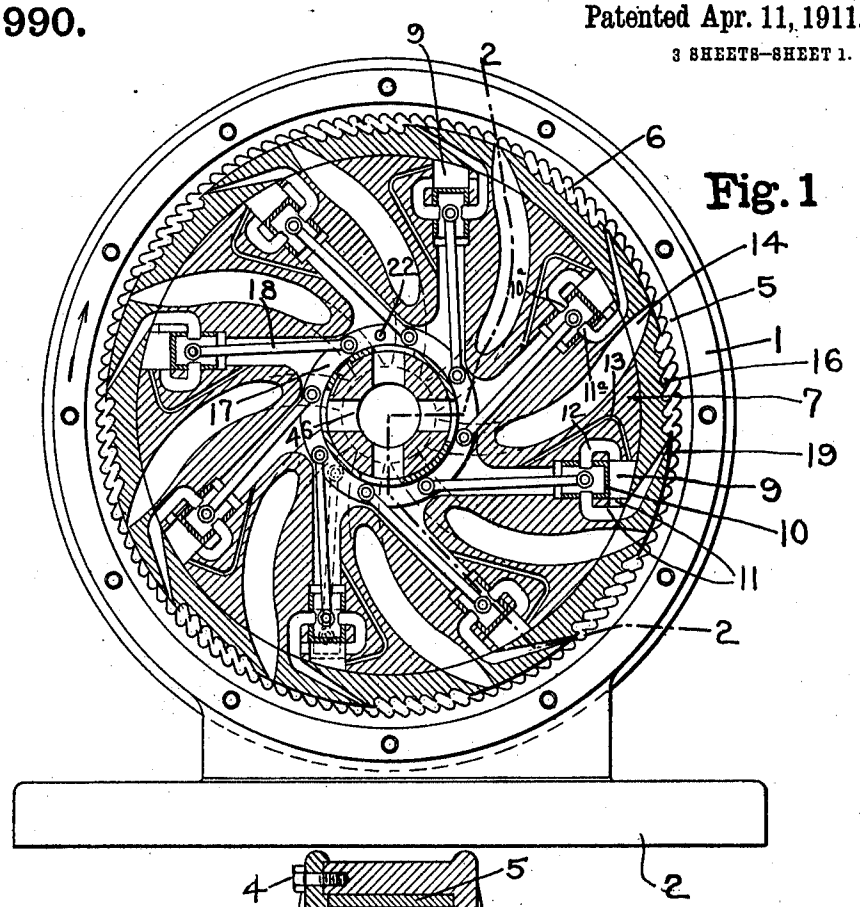

Fig. 1

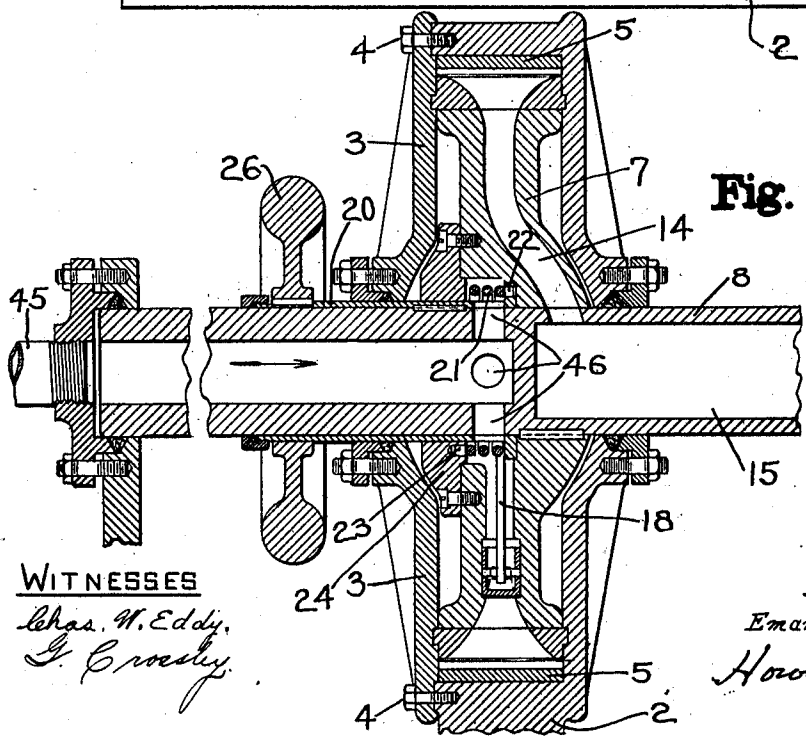

Fig. 2

WITNESSES

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3 SHEETS—SHEET 2.

Fig.5

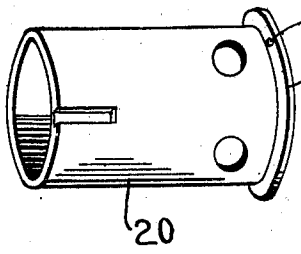
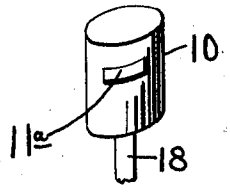


Fig.6



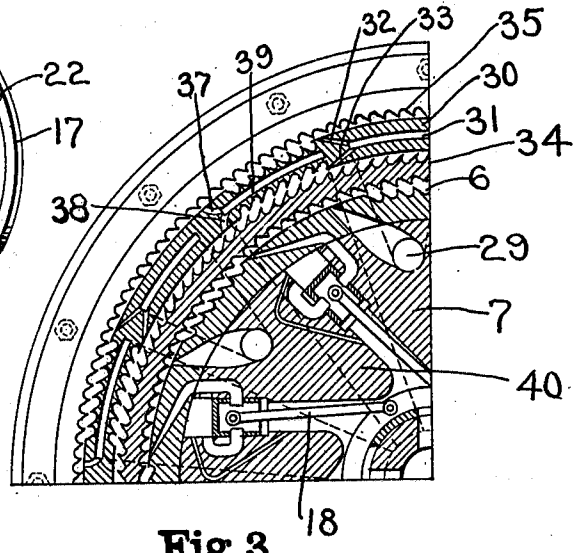


Fig.3

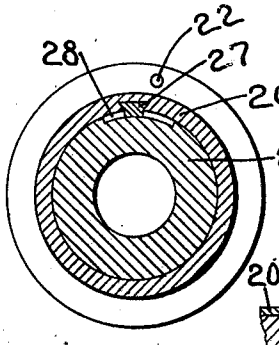


Fig. 10

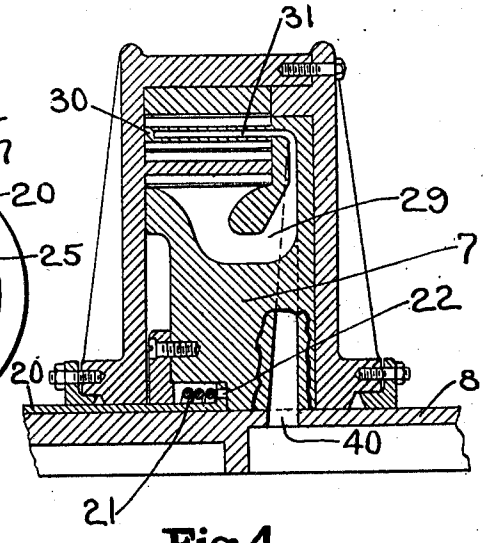


Fig.4

WITNESSES.

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3 SHEETS—SHEET 3.

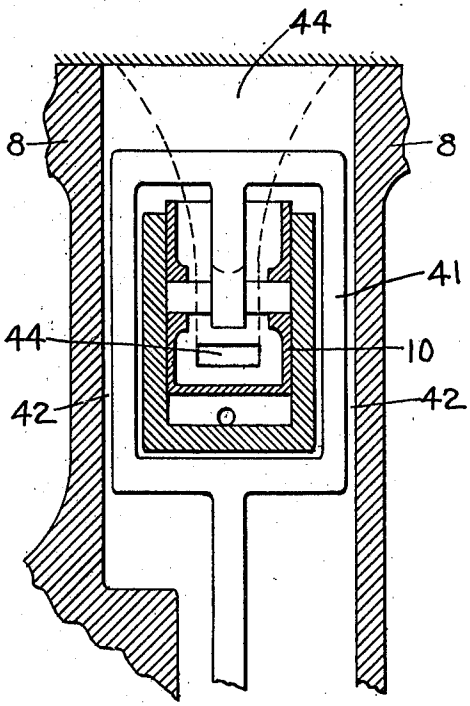

Fig. 7

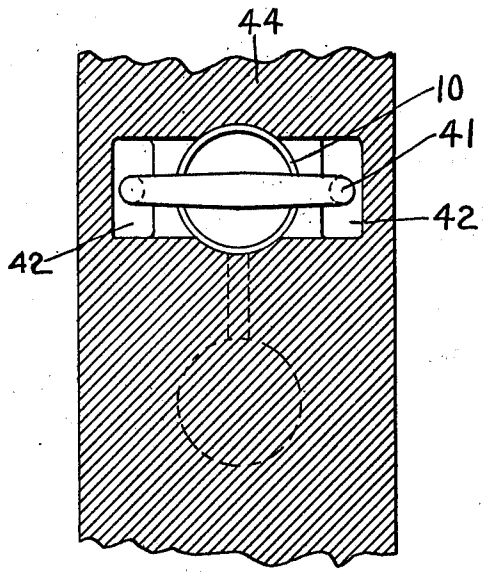

Fig. 8

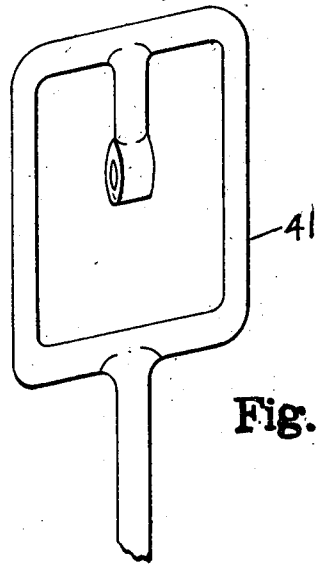

Fig. 9

WITNESSES

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UNITED STATES PATENT OFFICE.

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TURBINE.

988,990. Specification of Letters Patent. Patented Apr. 11, 1911.

Application filed July 16, 1910. Serial No. 572,407.

To all whom it may concern:

Be it known that I, EMANUEL FISHER, Jr., a citizen of the United States, residing at Providence, in the county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Turbine-Engines, of which the following is a specification, reference being had therein to the accompanying drawing.

This invention has reference to improvements in steam turbines and its object is to provide a turbine engine wherein the steam is compounded by simple and effective means, and also where the inlet ports are automatically controlled by valves to regulate the flow of steam.

A further object is to provide simple governing means for automatically controlling the action of said valves. And yet a further object of the invention is to provide means whereby the engine may exhaust through the center shaft thereby facilitating a construction whereby the compound action of the steam may be more readily effected.

With these and other objects in view, the invention consists of certain novel features of construction as will be more fully described and particularly pointed out in the appended claims.

In the accompanying drawings: Figure 1— is a central sectional elevation of my improved turbine engine. Fig. 2— is a side elevation sectioned on line 2—2 of Fig. 1. Fig. 3— is a central sectional end view showing a portion of my improved turbine arranged to operate as a compound engine. Fig. 4— is a side elevation showing a portion of said compound construction. Fig. 5— is an enlarged detail in perspective showing the governor sleeve. Fig. 6— is an enlarged detail in perspective showing one of the piston valves. Fig. 7— is a modification illustrating means whereby the steam pressure may act inwardly or toward the center on the valves, for the purpose of counteracting the action of the centrifugal force upon said valves. Fig. 8— is a sectional view taken on line 8—8 of Fig. 7. Fig. 9— is a perspective view showing the form of connecting rod employed for operating this modified form of valve mechanism. Fig. 10— is a section through the sleeve and shaft showing the elongated key slot to permit a limited rotation of the sleeve on the shaft.

Similar reference characters represent the same or similar parts in all of the views.

Referring to the drawings there is shown a cylindrical casing 1 which is mounted upon or formed as a part of a suitable base 2. A removable plate 3 is arranged to be secured by bolts 4 to the casing to facilitate the assembling of the parts. Within this casing 1 is fixed a ring 5 whose inner face is corrugated as at 6, see Fig. 1, thereby providing a multiplicity of small pockets all around the inner surface of said casing into and against which the jet of steam may impinge for the purpose of causing the drum to rotate. This drum 7 is centrally mounted on, and fixed to shaft 8 to rotate within said casing and the same is provided with a plurality of radial steam conducting passageways 9 the outlet from each of which is controlled by a valve 10 preferably balanced and of the piston type. Each piston is provided with a slot 10^a on one side, and a slot 11^a on its opposite side and said piston is arranged to reciprocate to open and close the steam ports and control the passage of steam through the jet opening 19 to act against the corrugated surface 6 above described. The slot 10^a in this valve permits the steam to pass through port 12 to the opposite side of the piston valve 10 for the purpose of counterbalancing the pressure on the same, and from where condensation may escape through the bleed duct 13. The steam that passes in through steam port 11 after acting upon the various corrugations, passes out through its individual exhaust channel 14 into the central tubular exhaust chamber 15 from whence it is led away in any desired manner.

In practice a highly economical effect of steam is obtained in this simplified form of engine illustrated in Fig. 1, by providing, in addition to the corrugations in the casing, a short series of sections of corrugations in the surface of the drum 7 as at 16 each set to be acted upon by the steam from its own individual jet, said corrugations being located between each said jet opening and its exhaust port, whereby the steam may act and react back and forth upon the different corrugated surfaces utilizing such force as the steam possesses before passing out through the exhaust port 14. By corrugated, I mean to include any surface that may be provided

with teeth or blades, or ridges and grooves against which the steam may impinge for the purpose of actuating the rotating member. Any desired number of pressure passageways and valves 10, may be located in this central drum and all of said valves may be controlled and operated from a single rotatable ring or collar 17 which is connected to the sleeve 20 to which collar all of said valves are connected through their rods 18. This sleeve 20 is rotatably mounted on the shaft 25 and its end extends out through the casing upon which end the momentum wheel 26 is mounted and fixed. The extent of rotation of the sleeve is controlled by the key 27 working in the circular slot 28 as illustrated in Fig. 10. In order to hold these valves normally in their wide open position when the engine is at rest, I have provided a coil spring 21, see Fig. 2, having several turns around said sleeve, one end of said spring engaging the hole 22 in said collar, and the opposite end engages the hole 23 in the plate 24 and later being fixed to the central drum.

In order to compound or again use the steam expansively, I have provided the construction illustrated in Figs. 3 and 4, whereby the steam from the first ring 6 in each section, is conducted through a passageway 29, see Fig. 4, outwardly into the concentric ring 30 to operate upon another section, which ring is arranged to rotate with the central drum 7. From the recess 31 in this ring the steam is conducted through ports 32 and 33 to act simultaneously upon the corrugations in the outer face of the fixed ring 34 and upon the inner face of the outer fixed ring 35, again using the expanding force of the steam. In addition to the corrugations in the fixed rings 34 and 35, the movable ring 30 may also be corrugated as at 40 and 41 in order to utilize the effective energy of the steam to the best advantage. After the steam has passed over and acted upon this corrugated surface it is allowed to pass out through the exhaust ports 37 and 38 and channels 39 and 40 and inwardly to the hollow center of shaft 8, the lower end of channel 40 being shown by the broken away section in Fig. 4. In order to overcome the action of centrifugal force upon these rapidly revolving piston valves and their operating parts, I have formed steam passageways 42—42 around each side of valve 10, see Figs. 7 and 8 and have admitted the steam pressure to the valves from the outer side to press inward toward the center of the engine, and connected the piston to the ring 17 through the yoke 41, see Figs. 7 and 9, in other respects the valve operates like that illustrated in Figs. 1 and 2, controlling the admission of steam through port 44.

The operation of my improved turbine may be more fully described as follows: The steam is admitted through pipe 45 to the end of the hollow center shaft and conducted through aperture 46 and by way of the main radial passageways 9, ports 11, and jet opening 19, to impinge against the corrugated surface 6 at various points about its circumference and by means of which impinging jets the central drum is caused to rotate rapidly and with great force in the direction of the arrow. In order to control the flow of steam through these various ports, I have provided a valve 10 for each passageway and all of these valves are connected to a common central ring or collar to be operated simultaneously to control the opening through their respective ports and to control the speed and power to be developed by the engine. When the engine is at rest these valves are held in their wide open position by the action of the coil spring 21 and when the engine is rotating these valves are caused by centrifugal force to overcome the tension of said spring and move outward toward their closing position, in other words the spring serves as a governor to hold the engine at a constant predetermined speed balancing the centrifugal force upon the piston. If, however, there is a sudden increase in the load such as to momentarily retard rotation of the shaft 8, the inertia of the momentum wheel 26 gives to it the tendency to continue at the same speed as before, thereby rotating the sleeve and opening the valves, giving the engine more steam and cause it to again assume its normal speed.

The feature of providing an extra set or short section of corrugation 16 upon the peripheral face of the rotating drum between each set of pressure and exhaust ports renders the use of the steam in such an engine very much more economical and effective.

My invention is not restricted to the precise construction and arrangements of parts herein shown and described, as a plurality of valves of any convenient construction all coupled up together and arranged to be automatically and simultaneously actuated to control the operation of a turbine engine, also any means of causing the pressure to balance the action of centrifugal force upon said valves, comprising structures within the terms of the appended claims will fall within the spirit and scope of my invention.

What I claim is:

1. A steam turbine comprising a rotatable member containing a plurality of steam passageways, valves controlling said passageways and means for automatically moving said valves simultaneously, said means including valve actuating rods located in said passageways.

2. A steam turbine comprising a rotatable

member containing a plurality of steam passageways, valves located in said member for controlling said passageways and means for automatically actuating said valves simultaneously, said means including a rotatably adjustable ring, and rods in said passageways connecting the valves with said ring.

3. A steam turbine comprising a rotatable member containing a plurality of steam passageways, piston valves located in said member for controlling said passageways, means for automatically actuating said valves simultaneously, and means for causing the steam pressure to balance said valves against centrifugal force.

4. A steam turbine comprising a rotatable member containing a plurality of steam passageways, piston valves located in said member for controlling said passageways, means for actuating said valves simultaneously, and means whereby the steam is caused to press the valves toward the axis of rotation to balance said valves against centrifugal force.

5. A steam turbine comprising a rotatable member containing a plurality of steam inlet passageways radiating outward from the center thereof said member also being provided with a plurality of exhaust passageways leading back to a common center outlet, valves controlling said inlet passageways and means for automatically actuating said valves simultaneously.

6. A steam turbine comprising a rotatable member said member containing a plurality of inlet passageways radiating outward from the center thereof, said member being also provided with a plurality of exhaust passageways leading back to a common center outlet, valves controlling said inlet passageways, a fixed corrugated portion against which the steam from said jets impinge and a second corrugated portion arranged to rotate with said member and coöperate with said first mentioned corrugations as the steam passes from the inlet to the exhaust port.

7. A steam turbine comprising a rotatable member containing a plurality of steam passageways, valves controlling said passageways means connecting said valves to a common central plate and a momentum wheel connected to said plate for the purpose of controlling the position of said valves.

8. A steam turbine comprising a rotatable member containing a plurality of steam passageways, valves controlling said passageways means connecting said valves to a common central plate, a spring serving to counteract the action of centrifugal force on said valves and a momentum wheel connected to said plate for the purpose of controlling the position of said valves.

9. A steam turbine comprising a rotatable member containing a plurality of steam passageways, reciprocating valves controlling said passageways means connecting said valves to a common central plate a coil spring serving to counteract the action of centrifugal force of said valves and a momentum wheel connected to said plate.

10. A steam turbine comprising a plurality of alternate rotatable and fixed concentric rings each being provided with corrugated steam contacting surfaces forming a plurality of sets of steam receiving chambers and means whereby the steam is caused to act upon each set of chambers successively before finally exhausting.

11. A steam turbine comprising a rotatable member provided with a plurality of steam passageways having contracted inlet openings, a fixed concentric ring forming a space or chamber between it and the face of said rotating member the walls of said chambers being provided with corrugations, a second concentric ring also forming a set of chambers having corrugated surfaces and means for conducting the steam from the first to the second set of chambers to act expansively therein before finally exhausting.

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

EMANUEL FISHER, Jr.

Witnesses:
Howard E. Barlow,
G. Crossley.