

W. M. ESTERLING.
REVERSIBLE STEAM TURBINE.
APPLICATION FILED MAY 4, 1908.

933,028.

Patented Aug. 31, 1909.

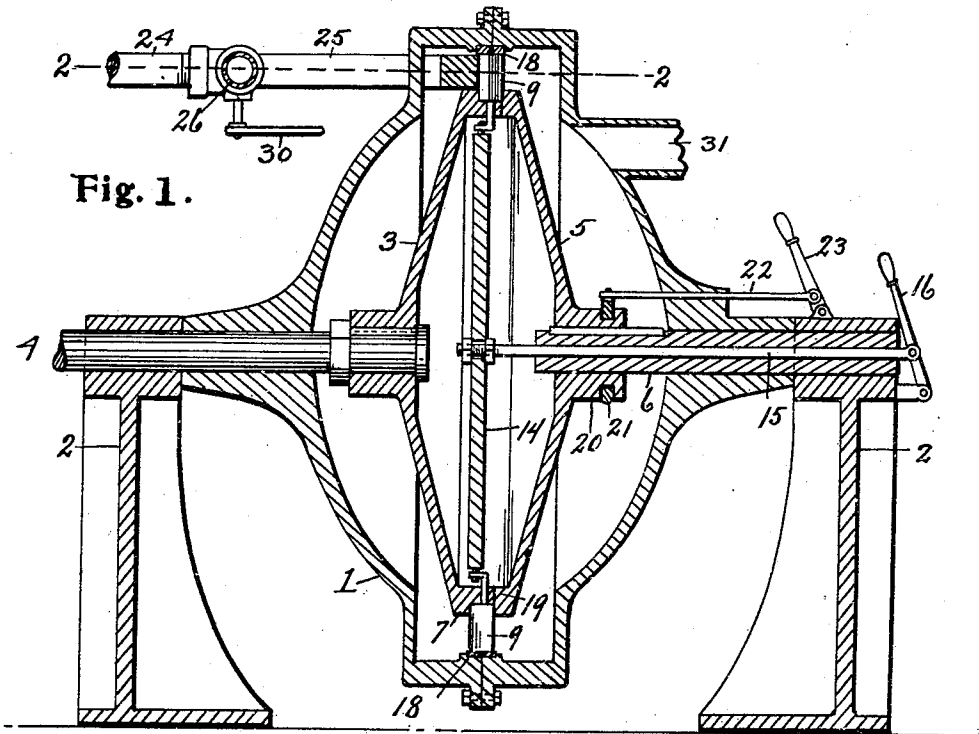


Fig. 1.

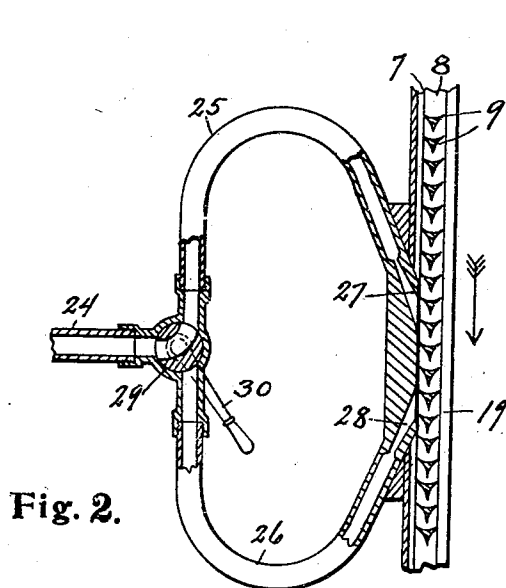


Fig. 2.

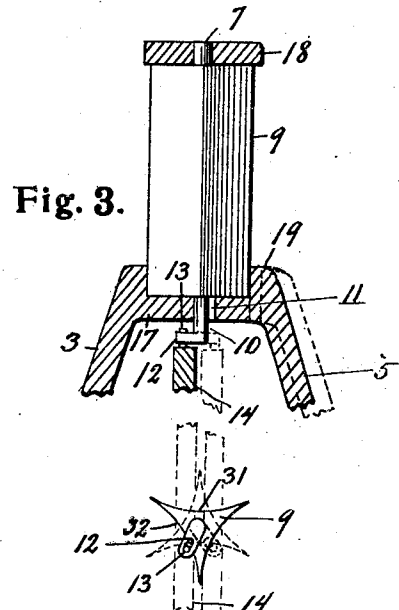


Fig. 3.

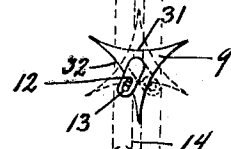


Fig. 4.

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REVERSIBLE STEAM-TURBINE.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, WILLIAM M. ESTERLING, a citizen of the United States, residing at Detroit, in the county of Wayne, State of Michigan, have invented certain new and useful Improvements in Reversible Steam-Turbines; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the figures of reference marked thereon, which form a part of this specification.

This invention relates to steam turbines, and consists in the construction and arrangement of parts hereinafter more fully set forth and pointed out particularly in the claims.

The object of the invention is to produce a steam turbine of comparatively simple and inexpensive construction, wherein the arrangement is such as to render the engine readily reversible.

The invention further contemplates such a construction and association of the operative parts as to enable the carrying out of the reversible feature in a practicable manner.

The above object is attained by the structure illustrated in the accompanying drawings, in which:—

Figure 1 is a sectional view through a steam turbine involving my invention. Fig. 2 is a diagrammatical view in horizontal section through the upper portion of the case and the steam induct nozzles, together with a sectional view through a three-way valve in the steam supply pipe, as on dotted line 2—2 of Fig. 1. Fig. 3 is a fragmentary view, partly in section, showing one of the movable vanes through the movement of which the direction of rotation of the engine may be reversed. Fig. 4 is a diagrammatical view, showing by dotted lines the movement of the vanes.

Referring to the characters of reference, 1 designates the case which is globular in form and supported between the pillow blocks 2. The vane wheel is located within the case and is in the form of a concavo-

convex disk, comprising a fixed section 3 rigidly mounted upon the inner end of the working shaft 4, and a movable section 5 splined upon the inner end of the idle shaft 6. Projecting inwardly from the rim of the section 3 of the vane wheel is a lateral flange 7 having a peripheral channel 8 therein in which are seated the radially disposed vanes 9 having upon their inner ends the crank pins 20 which pass through slotted openings 11 in the flange 7. The cranks 12 of said pins are journaled on the pins 13 projecting radially from the periphery of the circular disk 14 centrally disposed within the vane wheel and loosely carried upon the longitudinally reciprocatory rod 15 which passes through and is supported in the shaft 6, said rod having attached to its outer end a lever 16, or other suitable means for moving it longitudinally. The outer ends of the vanes 9 are provided with journal pins 17, as clearly shown in Fig. 3, which are mounted in a ring 18 adapted to revolve in a circular way in the inner wall of the casing. The vanes, as will be seen, are trilateral and are provided with concaved faces.

The peripheral flange 19 of the movable section 5 of the vane wheel forms one of the margins of the channel in the flange 7 of the section 3 of said wheel in which the vanes are seated and engages the edges of the vanes to assist in retaining them in position.

When turning the vanes for the purpose of changing the angle thereof to reverse the direction of the rotation of the vane wheel, it is necessary to withdraw or retract the movable section 5 of the vane wheel in order to leave the vanes free to turn upon their supporting pins. For the purpose of retracting the movable section of the vane wheel, its hub 20 is provided with a channel in which is seated a ring 21. Attached to said ring is a longitudinally movable rod 22 which passes through and is supported in the case, and to the outer end of which is pivoted an actuating lever 23. By a movement of said lever the section 5 of the vane wheel may be caused to slide upon the shaft 6.

The steam supply pipe is indicated at 24, said pipe being provided with the curved branches 25 and 26 which terminate in the expansion nozzles 27 and 28 respectively, said nozzles discharging in opposite directions onto the vanes of the wheel at an angle thereto and in the direction of rotation thereof. At the juncture of the curved branches with the main steam pipe is located a three-way valve 29 adapted to be actuated through the medium of a lever 30 for the purpose of directing the steam through either of said branches, as will be well understood.

With the parts in the position shown in Figs. 1 and 2, steam will be projected from the nozzle 27 onto the curved surfaces 31 of the vanes of the wheel (see Fig. 4) with such impact as to cause the wheel to revolve in the direction indicated by the arrow in Fig. 2, thereby turning the shaft 4 to which may be connected any suitable means for transmitting the power. The steam after acting upon the vanes of the wheel, passes between them and into the case, from which it escapes through the port 31. Should it be desired to reverse the vane wheel to cause the shaft 4 to turn in the opposite direction, the section 5 of the vane wheel is retracted through the operation of the lever 23 so as to carry the flange 19 thereof from engagement with the edges of the vanes 9, as shown by dotted lines in Fig. 4, when by drawing outwardly upon the rod 15 through the operation of the lever 16, the disk 14 will be shifted laterally to turn the crank pins 10 and swing the vanes to the position shown by dotted lines in Fig. 4, in which position the curved faces 32 of the vanes will stand transversely of the path of projectment from the nozzle 28, and in which position the vanes are held by returning the movable section 5 of the vane wheel into engagement therewith in its normal position, when by turning the valve 29 so as to connect the branch 26 with the supply pipe 24, steam will be projected from the nozzle 28 onto the faces 32 of the vanes to propel the vane wheel in the opposite direction, as will be well understood; the steam after acting upon the vanes passing between them and from the case through the exhaust pipe 31.

The vane wheel may be made to turn in its original direction by cutting off the steam from the nozzle 28, restoring the vanes to their normal position and again directing the steam through the nozzle 27.

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

1. In a steam turbine, the combination of a casing, a vane wheel journaled therein, a rotary ring in a channel of the casing, vanes movably mounted extending between and

supported by said wheel, and ring, means for changing the angle of said vanes, and means for directing steam onto the vanes to cause a rotation of the vane wheel.

2. In a steam turbine, the combination of a casing, a vane wheel mounted to rotate therein, movable vanes set in said wheel having two working faces lying in different planes, means for moving the vanes to change the position of said working faces, and means for directing steam onto the vanes in either working position.

3. In a steam turbine, the combination of a casing, a vane wheel journaled therein, a plurality of vanes pivoted in the periphery of the vane wheel, each vane having a plurality of working faces, means for turning said vanes to present the different working faces thereof to the impact of the steam, and means for directing steam to said vanes from opposite directions.

4. In a steam turbine, the combination of a casing, a vane wheel journaled therein, a series of vanes pivotally mounted in said wheel having a plurality of working faces, means connected with the pivots of the vane wheels for effecting a simultaneous adjustment of the vanes to bring the different working faces thereof into action, and means for directing steam to the vanes of the wheel.

5. In a steam turbine, the combination of a casing, a vane wheel journaled therein comprising two parts, one of which is movable with respect to the other, a plurality of vanes pivotally mounted in one of the parts of the vane wheel and normally held in place by the movable part, means for moving the movable part of the vane wheel to permit of the adjustment of the vanes, means for adjusting the vanes to change the angle of their working faces, and means for directing steam to the vanes in either working position.

6. In a steam turbine, the combination of a casing, a vane wheel journaled therein, a plurality of vanes pivoted in the vane wheel, a part of the vane wheel being movable to release said vanes, a movable part within the vane wheel connected to the vanes to effect an adjustment thereof, and means for directing steam to the vanes in either working position.

7. In a steam turbine, the combination of a casing, a vane wheel journaled therein, a series of vanes pivoted in the vane wheel, said vane wheel having a movable part adapted to engage the vanes to hold them in position, a circular disk within the vane wheel having a jointed connection with the pivots of the vanes, means for moving said disk to shift the vanes in the wheel, and means for directing steam to the vanes.

8. In a steam turbine, the combination of

a casing, a vane wheel journaled therein, a rotary ring in a channel of the casing, a plurality of vane wheels pivoted at their ends in said ring and in the periphery of the
5 vane wheel respectively, means for turning said vanes upon their pivots, and means for directing steam to the vanes.

In testimony whereof, I sign this specification in the presence of two witnesses.

WILLIAM M. ESTERLING.

Witnesses:

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I. G. HOWLETT.