

H. A. KING.

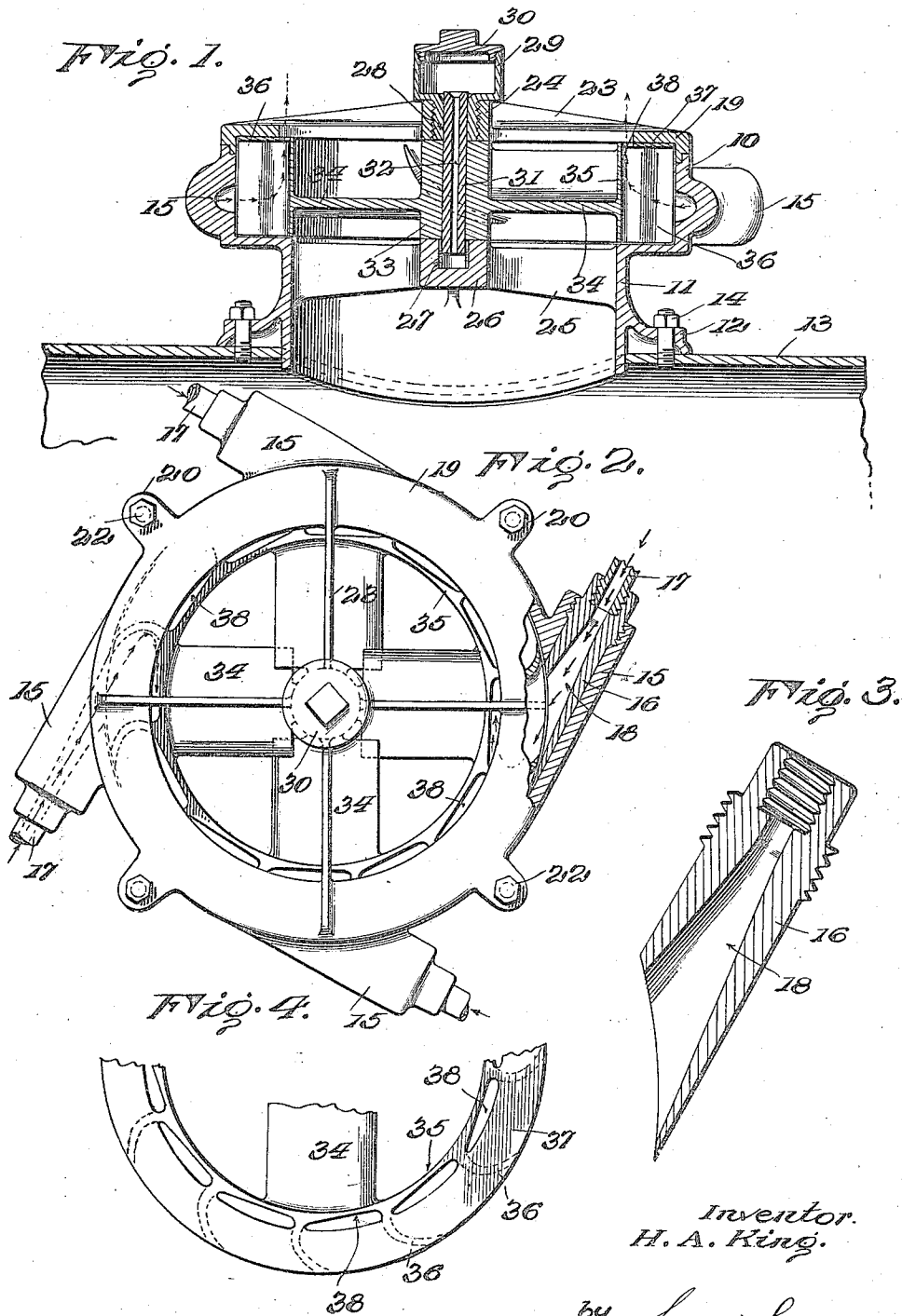
TURBINE.

APPLICATION FILED DEC. 6, 1919.

1,424,167.

Patented Aug. 1, 1922.

2 SHEETS—SHEET 1.



Inventor.
H. A. King.

by *Larry & Larry*
his *Attys*

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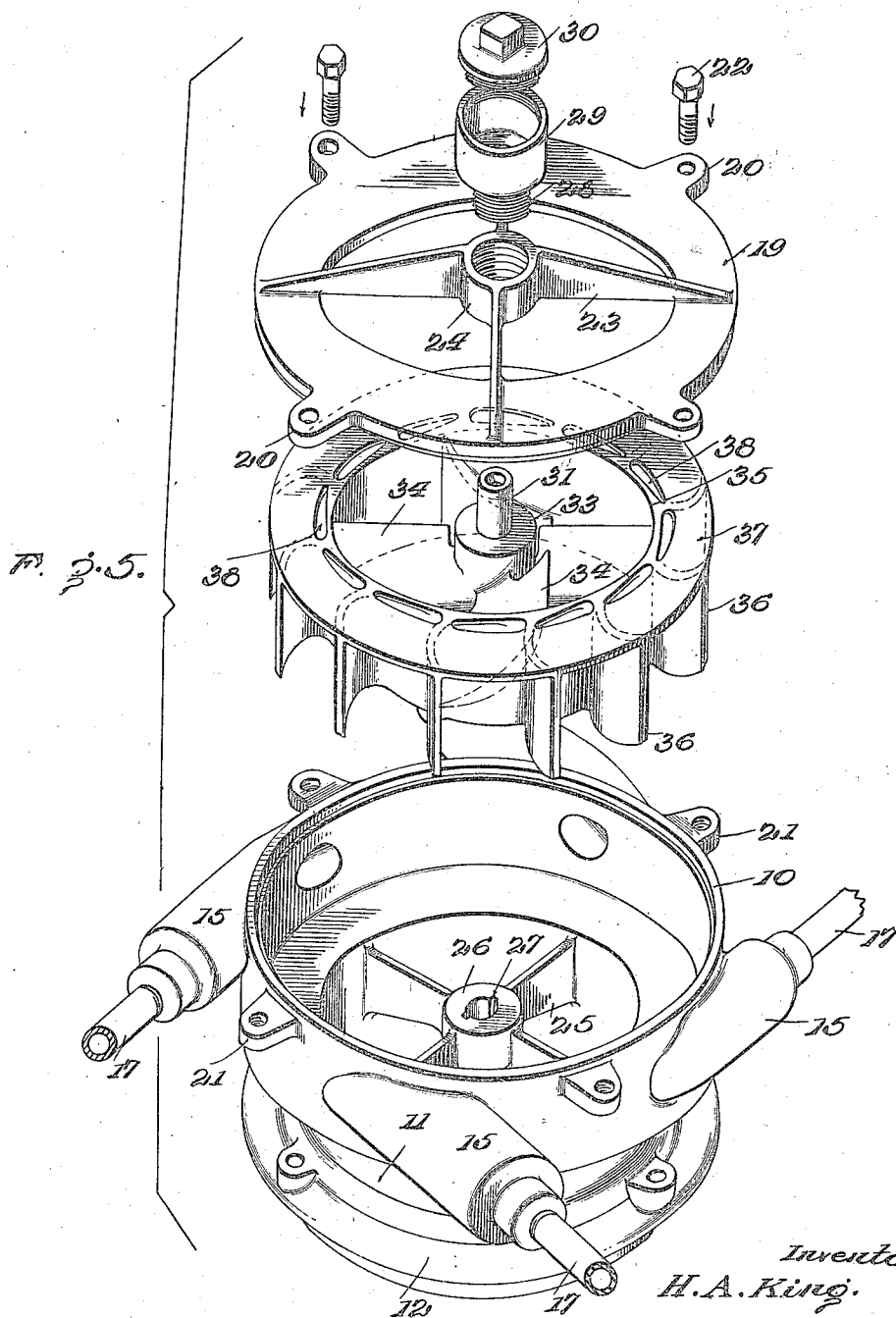
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2 SHEETS—SHEET 2.



Inventor.
H. A. King.
by *Louis H. King*
his atty.

UNITED STATES PATENT OFFICE.

HENRY A. KING, OF BALTIMORE, MARYLAND.

TURBINE.

1,424,167.

Specification of Letters Patent.

Patented Aug. 1, 1922.

Application filed December 6, 1919. Serial No. 342,937.

To all whom it may concern:

Be it known that I, HENRY A. KING, citizen of the Republic of China, residing at Baltimore, State of Maryland, have invented certain new and useful Improvements in Turbines, of which the following is a specification.

This invention relates to an improved turbine and seeks as one of its principal objects to provide a device of this character particularly adapted for use in connection with my improved feed water heating mechanism as shown and described in my pending application filed December 20, 1920, Serial No. 431,928, and wherein all of the exhaust steam from the locomotive cylinders is diverted and conserved.

The invention has as a further object to provide a device for producing a draft through a locomotive firebox positively, wherein the induction will be constant and wherein the device will at all times be under control of the operator so that the draft may be readily governed.

The invention has as a further object to provide a device of low initial cost, which may be readily installed, and which will embody mechanical features whereby wear and the cost of consequent up keep will be reduced to a minimum.

And the invention has as a still further object to provide a device which will be economical in the consumption of steam.

Other and incidental objects will appear hereinafter.

In the drawings:

Figure 1 is a vertical sectional view taken centrally through the device, the device being shown in position upon a conventional locomotive smoke box,

Figure 2 is a top plan view of the device, this view particularly illustrating the mounting of the steam nozzles employed,

Figure 3 is a sectional view showing one of the nozzles in detail,

Figure 4 is a fragmentary detail plan view showing a portion of the rotor employed, and

Figure 5 is a perspective view showing the parts of the device disassembled but in proper relative position.

In carrying the invention into effect, I employ a cylindrical stator 10 open at its upper side and leading into this stator at its lower side is a reduced axially extending air inlet 11 which, in the present instance, forms a

stack. As particularly shown in Figure 1, this stack may be fitted through the wall of a smoke box at its upper side and extending from the stack is a radial annular flange 12 curved to fit the smoke box. In this figure a portion of a conventional smoke box has been indicated at 13. Engaged through said flange and through the smoke box wall are bolts or other approved fastenings 14 firmly securing the device to the smoke box to upstand therefrom. The stator is formed at spaced points about its periphery with a plurality of tangentially disposed sockets or nipples 15 and mounted in these sockets to open into the stator are steam nozzles 16, one of these nozzles being shown in detail in Figure 3. In the present instance, I have shown the use of four of these nozzles. However, as will, of course, be understood, the number of nozzles employed may be varied as desired, the stator being provided with a corresponding number of sockets accordingly. As particularly shown in Figures 2 and 3, the nozzles are externally threaded adjacent their outer ends to engage within the sockets and are also internally threaded at their outer end portions to each receive a steam supply pipe 17. As will be observed, the nozzles are provided with arcuate inner ends conforming to the curvature of the side wall of the stator so as to lie flush therewith and formed through each of said nozzles is a steam passage 18. As will be noted, these passages at their outer ends are provided with reduced throats from which the passages are flattened somewhat and flared laterally to a wide mouth at the discharge end of each of the passages.

The stator is formed of upper and lower sections, the lower section carrying the stack 11. The upper section is in the nature of an abutment ring 19 jointed to the side wall of the stator at its upper edge and overhanging the wall at its inner side. Spaced lugs 20 project radially outward from the ring while similarly spaced lugs 21 project from the side wall of the stator and engaging through these lugs are bolts or other approved fastenings 22 firmly securing the sections together. The ring 19 carries a spider 23 axially of which is formed a sleeve 24. The stack 11 also carries a spider 25 axially of which is formed a bearing 26 closed at its lower end and having vertical grooves 27 in the side wall thereof. Threaded through the sleeve 24 is a bushing 28 formed upon the

lower end of a grease cup 29 and closing said cup is a removable cap 30.

Journalled at its upper end portion in the bushing 28 and at its lower end portion in the bearing 26 is a rotor shaft 31 having an axial channel 32 therethrough and mounted upon said shaft is the rotor employed. The rotor includes a hub 33 shrunk or otherwise fixed upon the shaft to be snugly but freely received between the sleeve 24 and the bearing 26, and extending radially from the hub is a plurality of fan blades 34. In the drawings, I have shown the use of four such blades equally spaced about the hub. However, as will be appreciated, the number of blades used may be varied and, as will be noted, the blades are arcuate in cross section, being arranged, as particularly shown in Figure 1, with their concave sides presented to the direction of rotation of the rotor and being tilted each about its axis. Surrounding the blades is a rim 35, it being observed that the hub, blades and rim are preferably formed as an integral structure, and projecting from the rim is a plurality of spaced arcuate driving blades 36 closely approaching the side and bottom walls of the stator. Overlying the blades is an annular plate or web 37 extending radially from the rim at its upper edge and integral with the rim and blades, the web confronting the inner face of the ring 19 in parallel relation thereto. It is now to be noted that the rim 35 is of an internal diameter substantially corresponding to the internal diameter of the stack. However, the major diameter of the rim is somewhat less than the internal diameter of the ring 19. Consequently, the web 37 is exposed at its inner margin. This web serves to define an annular chamber about the rim 35 of the rotor, said rim forming the inner wall of the chamber and the side wall of the stator the outer wall of said chamber. The upper wall of the chamber is provided by the web 37 and the lower wall thereof by the bottom wall of the stator. The driving blades 36 divide this chamber into a plurality of pockets and formed through the exposed inner margin of the web 37 is an annular series of exhaust ports 38 for the pockets, each of the pockets being, of course, provided with one of said ports. As particularly shown in Figure 5, these ports extend circumferentially of the web in concentric relation to the axis of the rotor and are somewhat enlarged toward corresponding ends thereof.

In the use of the device, steam is admitted through the pipes 17, the flow of steam being, of course, under the control of the operator. Upon reaching the nozzles 16, the steam will, as it emerges from the throats of the passages 18, be permitted to expand as it flows toward the mouths of the nozzles. Consequently, the steam will forcibly issue from the nozzles in jets and these jets impinging

against the driving blades 36, as suggested in dotted lines in Figure 2, will serve to drive the rotor and accordingly revolve the fan blades 34. In thus permitting the pressure of the steam to progressively fall as the steam flows into the pockets of the rotor, the steam jets will attain a proportionately high velocity so that but a correspondingly small volume of steam will be required for driving the rotor. Further, it is to be observed that the smaller ends of the exhaust ports 38 are presented to the direction of rotation of the rotor so that exhaust of steam immediately contiguous to the blades will be somewhat restricted. The steam jets after striking the blades will thus be caused to turn at a relatively sharp angle from said blades toward the larger ends of the exhaust ports and consequently, a maximum driving effect from the jets will be realized before the steam is discharged through the exhaust ports. It will thus be seen that as long as steam is admitted through the pipes 17, the rotor will be driven at an even speed so that the fan blades 34 will consequently act to set up an even and uniform upward draft through the stack 11 at any given speed. Owing to the partial vacuum thus created in the smoke box, a draft will accordingly be induced through the fire box of the locomotive. A given quantity of air may thus be drawn through the fire box and, of course, by properly increasing the volume of air supplied to the fire, more perfect combustion will be produced. Accordingly, by the use of the present device, fuels of the lower grades may be employed since the draft through the fire box may be accurately controlled for properly burning such fuels. Further, it will be seen that by the use of the present device, the draft may be accurately controlled for quickly raising the steam pressure of the locomotive boiler.

Lubrication of the device is, of course, effected by introducing a proper lubricant into the cup 29. About the upper end of the shaft 31 of the rotor, the bushing 28 is, as particularly shown in Figure 1, cut away so that the lubricant will flow downwardly between the shaft and bushing for effectually lubricating the upper journal of the shaft. Further the lubricant will, in the manner indicated, flow down to enter between the upper end of the hub of the rotor and the adjacent faces of the bushing and sleeve 24 for lubricating these surfaces and owing to the presence of the channel 32 through the shaft, the lubricant will, of course, flow through the shaft into the bearing 26 for lubricating the lower journal of the shaft. From the bearing 26 the lubricant will rise through the grooves 27 to enter between the upper end of the bearing and the lower end of the hub of the rotor for effectually lubricating these surfaces. Consequently, effec-

tive lubrication of the rotor will accordingly be insured so that wear will be reduced to a minimum.

Attention is now directed to the fact that as the steam enters the steam pockets of the rotor, the steam will, expanding equally in all directions, act against the bottom wall of the rotor and the web 37 for lifting upwardly upon the rotor and accordingly holding the rotor suspended so that the rotor will, in effect, float between the bearing 26 of the lower spider and the sleeve 24 of the upper spider. Free turning of the rotor will accordingly be materially enhanced so that in this way wear will not only be materially reduced but also, proportionately less energy will be required for driving the rotor. A further conservation in the volume of steam required to turn the rotor is thus effected. As the speed of the rotor is increased, an increased pressure of steam will, of course, be present in the pockets of the rotor for resisting the downward pull upon the fan blades of the increased partial vacuum set up in the smoke box. On the other hand, as the flow of steam to the rotor is decreased and the pressure of steam in the pockets of the rotor is decreased accordingly, the resultant decrease in the speed of turning movement of the rotor will, of course, result in a reduction of the partial vacuum in the smoke box so that, as will be seen, at all speeds of the rotor, a sufficient pressure of steam will be present in the pockets of the rotor for balancing the downward pull of the partial vacuum created in the smoke box. Consequently, the rotor will always float regardless of the speed at which it may be driven.

I accordingly provide a particularly effective device for the purpose set forth, the device itself supplanting the ordinary locomotive smoke stack and being particularly compact so as to provide for low clearance. However, I do not wish to be limited in this regard since, as will be appreciated, the blower could well be otherwise located upon a locomotive for producing a draft through the fire box and, in fact, is adapted for general use in any instance where it is desired to produce driven currents of air. I accordingly reserve the right to all such adaptations of the invention as well as all minor modifications and variations of the structure as may fall within the scope of the appended claims.

Having thus described the invention, what is claimed as new is:

1. A device of the character described including a stator, a rotor journaled thereon and provided with driving blades, means for introducing a motive fluid to the stator to act against said blades, and means carried by the rotor obstructing the path of discharge whereby the fluid may act between

the stator and rotor for suspending the rotor.

2. In a turbine, a stator, a rotor journaled thereon and provided with driving blades defining a plurality of steam pockets therebetween, and means for admitting steam to said pockets to impinge said blades and expand between a wall of the stator and said rotor for suspending the rotor, the rotor being formed to discharge the steam there- through opposite said wall.

3. A device of the character described including a stator, a rotor journaled thereon and provided with driving blades, there being a web connecting the driving blades and providing a plurality of pockets between said blades, and means for admitting a motive fluid to the stator to flow through said pockets and act between a wall of the stator and said web for suspending the rotor, the rotor being formed to discharge the fluid therethrough opposite said wall.

4. A device of the character described including a stator, a rotor journaled thereon and provided with driving blades, there being a ported web connecting the driving blades and providing pockets between such blades, and means for admitting a motive fluid to said pockets to impinge said blades and act between the stator and said web for suspending the rotor, the ports of the web providing exhaust ports for said pockets.

5. A device of the character described including a stator, and a fluid operated rotor journaled thereon and provided with ported means whereby the fluid will tend to suspend the rotor.

6. A device of the character described including a stator, and a fluid operated rotor journaled thereon and provided with ported steam pockets each closed at one side by a wall of the stator whereby steam in said pockets will tend to suspend the rotor.

7. A device of the character described including a stator, and a fluid operated rotor journaled thereon and having steam pockets ported at their upper sides and closed at their lower sides by a wall of the stator whereby steam flowing through said pockets to discharge at said ports will tend to suspend the rotor.

8. A device of the character described including a stator, and a rotor journaled upon the stator and provided with steam pockets respectively closed at two of the sides thereof and having two other sides closed by walls of the stator whereby steam in said pockets will tend to suspend the rotor, one of the closed sides of the pockets respectively being provided with an exhaust port.

9. A device of the character described including a stator having a wall provided with an opening therethrough, and a fluid operated rotor journaled upon the stator and

provided with a rim carrying steam pockets respectively closed at one side by said wall whereby steam in said pockets will tend to suspend the rotor, the rim registering
5 with said opening to cooperate with the wall.

10 10. A device of the character described including a stator body having a bottom wall provided with an opening therethrough, a rotor journaled upon the stator and having a rim registering with said opening to

cooperate with the wall, the rim being provided with a plurality of steam pockets respectively closed at one side by said wall whereby steam in said pockets will tend to
15 suspend the rotor, and a top ring connected to the stator body to overlie the pockets, the pockets being provided with discharge ports at the inner edge of said ring.

In testimony whereof, I affix my signature.
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HENRY A. KING. [L. S.]