

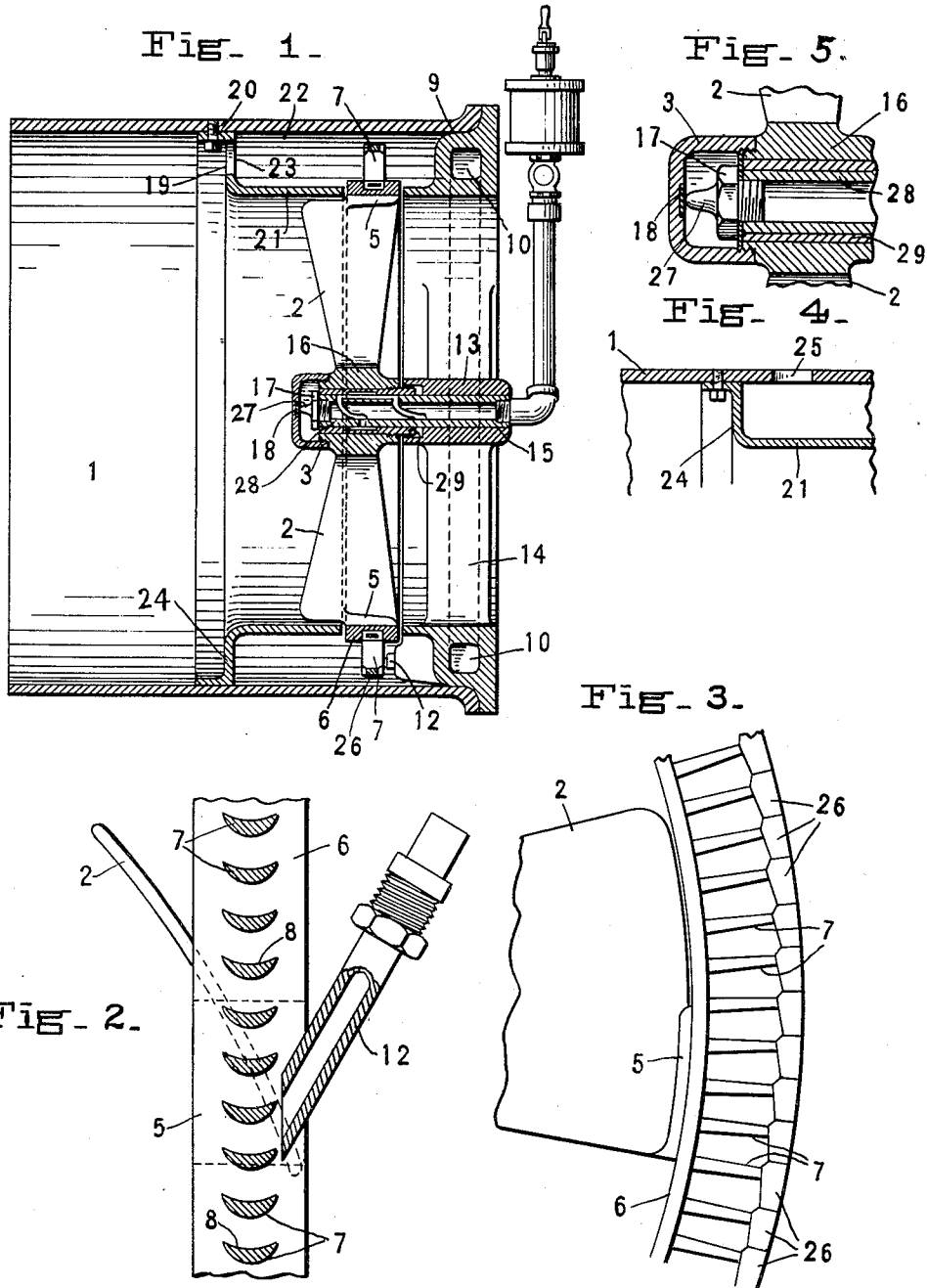
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To all whom it may concern:

Be it known that I, LEVI JULIAN WING, a citizen of the United States, and a resident of the borough of Manhattan, in the county of New York and State of New York, have invented certain new and useful Improvements in Fans, of which the following is a specification.

My present invention relates to improvements in fans generally, and in particular, to a combined fan and turbine motor.

The main object of my invention is the provision of an improved device of this sort combining a fan or air current producer and a turbine motor, of such character that the exhaust steam from the turbine will mingle with the air current produced by the fan, so that the combined air and steam may be used for the purpose of a forced draft device for boilers, etc.

A further object is to obviate to a large extent the objectionable friction due to the thrust of the fan while the same is in operation.

Another object is to provide a combined structure of the character set forth, simple and inexpensive in its construction, and which may be used for a great many purposes.

To this end the invention comprises the features of construction, combination of parts and arrangement of elements herein-after set forth.

In the drawings the invention is embodied in a concrete and preferred form but changes of construction may of course be made without departing from the legitimate and intended scope of the invention.

In the said drawings: Figure 1, is a vertical sectional view of a combined fan and turbine embodying my invention. Fig. 2, is an edge view in section of one of the vanes showing the arrangement of the buckets and the steam nozzle. Fig. 3, is an enlarged detail view of the outer portion of one of the vanes. Fig. 4, is a broken sectional view of a slightly modified form of the invention. Fig. 5, is a broken detail view of the end portion of the supporting shaft and the hub of the fan to illustrate more clearly the thrust bearing.

1 indicates a casing of any suitable construction, within which is mounted a plurality of vanes 2, on shaft 15, for producing or creating a current of air. Each vane is provided at its periphery with supporting

shoulders 5. Mounted upon these supporting shoulders is a circumferential bucket supporting member 6, having the buckets 7, attached thereto. These buckets are curved in cross section and stand so that the plane of the impact surfaces 8, is substantially parallel to the axis of rotation of the vanes. The buckets are preferably provided with angular abutting extensions 26, on their ends to stiffen and hold them properly spaced.

The means for supplying the steam to the turbine blades or buckets consists preferably of an annular ring member 9, which is applied to the casing and has an annular steam chamber 10, to which the steam is led by a duct (not shown) which enters to the steam chamber at one or more points, as desired. The angularly disposed nozzles 12, carried by the annular steam chamber convey the impelling fluid to the buckets. The annular ring member preferably serves also as the journal support for the fan and for this purpose it would have a hub part 13, carried by radial members or spokes 14, the hub supporting the journal or shaft 15, which for the purpose of feeding lubricant to the hub 16, of the fan, would preferably be of tubular form as shown.

An abutment or shoulder 29, is provided at the inner end of the supporting shaft and the fan is preferably secured in place on the shaft by means of a flanged retaining nut 17, the flange of which is adapted to engage the hub portion of the fan. The supporting shaft is preferably made hollow, as shown, so as to form an oil conduit, and the retaining nut is preferably secured direct in the open end of the hollow shaft so as to serve as a closure to the same. This retaining nut limits the outward movement of the fan on the shaft and the extent of outward movement of the fan may therefore be adjusted by means of this nut.

When in operation, the fan has a tendency to exert a powerful longitudinal thrust on the shaft and under ordinary circumstances this thrust would create considerable friction. To overcome this objectionable friction I mount a so-called thrust member on the fan which has a bearing on a stationary part carried by the shaft. This thrust member would preferably take the form of a dust cap 3, as shown, having a threaded or adjustable connection with the hub of the fan. The interior of the dust cap is har-

dened or is provided with an insert 18, of hardened material so as to provide a frictionless bearing surface. A stationary part on the end of the supporting shaft, preferably the retaining nut already referred to, has a protruding conical extension or bearing point 27, which is centrally located with respect to the hub of the fan and is adapted to be engaged by the hardened bearing surface on the interior of the dust cap. When the fan is in operation the bearing surface on the interior of the dust cap is in contact with the bearing point on the retaining nut and these two points therefore constitute a substantially frictionless thrust bearing, so that the friction due to the end thrust of the fan is practically negligible. By thus coming in contact with the stationary bearing point on the supporting shaft, the dust cap serves to limit the inward movement of the fan on the shaft and it will be evident that by adjusting the dust cap on the hub of the fan, the inward movement of the fan may be adjusted.

In order to utilize the full force of the impelling fluid, and to cause the steam to act on the blades expansively as well as by simple impact, I find it desirable to check the escape of the steam to a certain extent. For this purpose I prefer to use an annular member 19, having a securing flange 20, for fastening engagement with the walls of the casing, and an offset inwardly extending portion 21, of lesser diameter than the casing so as to form an expansion chamber 22. The exhaust steam escapes from this chamber by way of exhaust openings 23. The buckets carried by the vanes thus rotate within the chamber 22, while the vanes themselves rotate within the draft opening of the casing.

As it is desirable for certain purposes to humidify the air current generated by the fan, I prefer to allow the exhaust steam to commingle with the flow of air and to accomplish this result, the exhaust openings for the steam would preferably be formed in the radial portion 24, of the annular confining member 19. For certain other purposes, however, it is desirable that the air shall be free from moisture and in such a case the exhaust steam would be discharged out through the wall of the casing as shown at 25 in Fig. 4. In either case, the exhaust ports or openings would be staggered with relation to the nozzles so that the steam would not pass direct from the nozzles to

of the rotatable member adapted for engagement with the said stationary part for taking up the thrust created by the vanes.

2. In a fan, the combination with a casing, an expansion chamber within said casing, vanes rotatably mounted in the casing, buckets carried by the vanes and received in the expansion chamber, and means for causing a jet or jets of impelling fluid to impinge upon the buckets aforesaid, there being exhaust ports provided in the expansion chamber, whereby the impelling fluid after impinging upon the buckets will mingle with the air current produced by the vanes.

3. In a fan, the combination with a casing, an expansion chamber within said casing, vanes rotatably mounted in the casing, buckets carried by the vanes and received in the expansion chamber, a member applied to the casing and having an annular steam chamber therein, and nozzles carried by said member for directing the impelling fluid against the buckets aforesaid.

4. A fan comprising in combination a casing, a ring member applied thereto having an annular steam chamber, means for conducting the steam or impelling fluid to said steam chamber, a shaft supported by the said ring member, vanes rotatably mounted on said shaft, buckets carried by said vanes, an annular member carried by the casing forming in combination with the walls of the casing, an exhaust or expansion chamber within which the buckets revolve, exhaust ports in the said chamber, and nozzles on the ring member in communication with the steam chamber therein for conveying the impelling fluid to the buckets.

5. A fan comprising in combination a casing, a ring member applied thereto having an annular steam chamber, means for conducting the steam or impelling fluid to said steam chamber, a shaft mounted in the casing, vanes rotatably mounted on said shaft, buckets carried by said vanes, an annular member carried by the casing forming in combination with the walls of the casing, an exhaust or expansion chamber within which the buckets revolve, exhaust ports in the said chamber, nozzles on the ring member in communication with the steam chamber therein for conveying the impelling fluid to the buckets, and cooperating parts carried by the shaft and the vanes respectively, and constituting a thrust bearing to receive the thrust of the vanes while the fan is in operation.

expansion chamber, the annular member having exhaust ports therein permitting the exhaust steam to mingle with the air current produced by the fan.

5 7. In a fan, the combination with a casing, vanes mounted to revolve therein, buckets carried by the vanes, a ring member applied to the casing having an annular steam chamber, nozzles on the steam chamber in operative relation to the buckets on the vanes, 10 an annular member in the casing forming in combination with the walls of the casing, an expansion chamber, the annular member having exhaust ports therein permitting the 15 exhaust steam to mingle with the air current produced by the fan, the annular steam chamber member carrying the journal support for the vanes.

8. In a fan, the combination with a casing, 20 vanes mounted to revolve therein, buckets carried by the vanes, a ring member applied to the casing having an annular steam chamber, nozzles on the steam chamber in operative relation to the buckets on the vanes, 25 an annular member in the casing forming in combination with the walls of the casing, an expansion chamber, the casing having exhaust openings therein permitting escape of the steam from the expansion chamber.

30 9. A fan comprising in combination a casing, an expansion chamber within the casing, vanes rotatably mounted in the casing, buckets carried by the vanes and received in the expansion chamber, means for causing 35 a jet or jets of an impelling fluid to impinge upon the buckets aforesaid, and exhaust ports in the expansion chamber permitting escape of the impelling fluid from the casing after its impingement upon the buckets 40 aforesaid.

10. In a fan, the combination with a cylindrical open-ended casing, of a ring member removably applied to said casing, a supporting shaft carried by said ring member, 45 and a fan journaled on said shaft and disposed so as to direct a current of air through the casing, the said ring member and fan being bodily removable from the casing.

50 11. In a fan, the combination with a casing, of an annular supporting member applied thereto, a stationary shaft carried by said annular member, a member rotatably mounted on said shaft, vanes on said mem-

ber acting to create a thrust when the member is rotated, buckets on the rotatable member, a nozzle or nozzles for conveying an 55 impelling fluid to the buckets, exhaust ports adjacent the buckets for escape of the impelling fluid, a retaining member carried by the shaft to secure the rotatable member 60 thereon, and a cap carried by the rotatable member engaging the retaining member for taking up the thrust of the hub.

12. In a fan, the combination with a casing, of a supporting member applied there- 65 to and provided with an annular steam chamber, a stationary shaft carried by said annular member, a hub rotatably mounted on said shaft, vanes on said hub acting to create a thrust when the hub is rotated, 70 buckets carried by the vanes, a retaining member on the shaft for securing the hub thereon, a cap carried by the hub engaging the retaining member for taking up the thrust of the hub, and nozzles on the ring 75 member for conveying the impelling fluid to the buckets.

13. A fan comprising in combination, a casing, a stationary shaft supported in said casing, a hub rotatable on said shaft, vanes 80 on the hub, buckets carried by the vanes, nozzles in active relation to the buckets, a stationary part on the shaft and a cap on the inner end of the hub engaging said stationary part for taking up the thrust of the 85 same.

14. In a fan, the combination with a casing, of a ring member removably applied thereto and provided with an annular steam chamber, a shaft supported by said ring 90 member, vanes journaled to rotate on said shaft, buckets carried by said vanes, nozzles on the ring member for conducting the impelling fluid to the buckets, and means for securing the vanes upon the shaft, the vanes 95 and the ring member being bodily removable from the casing as a unit.

Signed at the borough of Manhattan, city of New York, in the county of New York and State of New York this 8th day of 100 February A. D. 1909.

LEVI JULIAN WING.

Witnesses:

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