

(No Model.)

J. YOUNG.
EXHAUST FAN.

No. 408,397.

Patented Aug. 6, 1889.

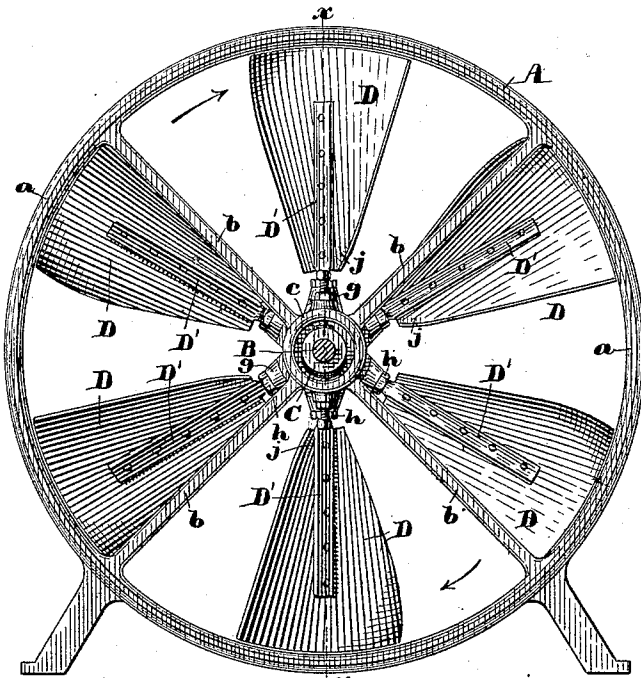


Fig. 1.

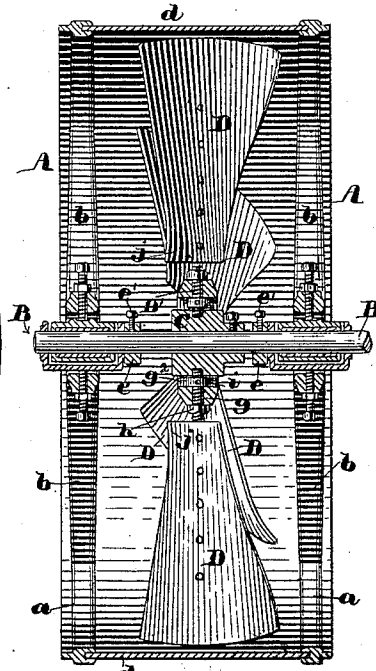


Fig. 2.

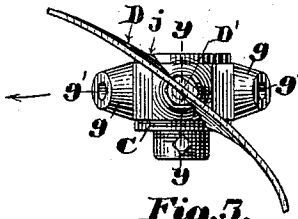


Fig. 3.



Fig. 6.

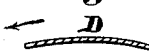


Fig. 7.



Fig. 8.

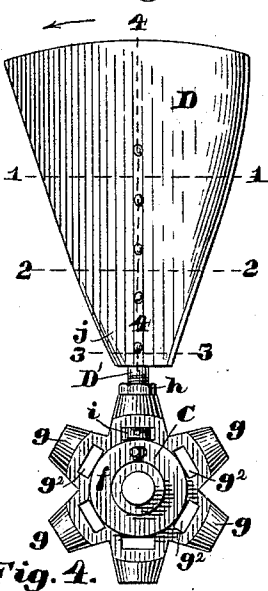


Fig. 4.

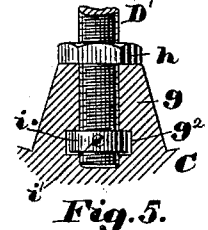


Fig. 5.

Witnesses:
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UNITED STATES PATENT OFFICE.

JEFFERSON YOUNG, OF CHELSEA, MASSACHUSETTS.

EXHAUST-FAN.

SPECIFICATION forming part of Letters Patent No. 408,397, dated August 6, 1889.

Application filed March 2, 1889. Serial No. 301,757. (No model.)

To all whom it may concern:

Be it known that I, JEFFERSON YOUNG, of Chelsea, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Exhaust-Fans, of which the following, taken in connection with the accompanying drawings, is a specification.

My invention relates to exhaust-fans, and has for its objects the production of a fan that shall be more effective in its operation than those heretofore in use, and the blades of which may be readily adjusted to vary their pitch without increasing or diminishing the distance from the ends of said blades to the axis of the fan.

My invention consists in certain novel features of construction, arrangement, and combination of parts, which will be readily understood by reference to the description of the drawings, and to the claims to be hereinafter given.

Figure 1 of the drawings is an elevation of an exhaust-fan embodying my invention. Fig. 2 is a vertical section on line *x x* on Fig. 1. Fig. 3 is a plan of the hub of the fan with all of the blades but one removed. Fig. 4 is an elevation of the central hub with one blade of the fan. Fig. 5 is a section through a portion of the central hub of the fan-wheel on line *y y* on Fig. 3 and illustrating the manner of securing the blades in position in said hub. Figs. 6, 7, and 8 are transverse sections of the fan-blade on lines 1 1, 2 2, and 3 3, respectively, on Fig. 4.

In the drawings, A A are two castings composed of rim *a*, spokes *b b*, and a central hub *c*, the inner edges of said rims *a* having formed therein annular grooves, in which are secured the edges of the sheet-metal hoop or band *d*, which, with said rims *a*, comprise the peripheral casing for the fan-wheel, the whole end areas inclosed by said casing, except what is occupied by the spokes *b b*, being left open.

B is the fan-shaft mounted in suitable bearings formed or secured in the hubs *c c* and projecting beyond one or the other of said hubs a sufficient distance to receive a driving-pulley of any suitable size and style, but not shown in the drawings.

The shaft B may be adjusted endwise in

its bearings, so as to project from either hub, according to the necessities of the place where it is to be used, and when properly adjusted it is prevented from moving endwise by the collars *e e*, secured to the shaft by means of the set-screws *e' e'*, as shown in Fig. 2.

Upon the shaft B, between the hubs *c c*, is firmly secured so as to revolve therewith the hub C of the fan, which hub is composed of a cylindrical center *f* and a series of radiating bosses *g*, in each of which is formed a radial hole *g'* and a transverse slot *g²*, extending through said boss at right angles to the hole *g'*, as shown in Figs. 4 and 5.

D D are the fan-blades, made, preferably, of sheet metal, and riveted to the shanks D', which project beyond the inner or narrower ends of said blades, and have formed upon said projecting portions male screw-threads, and have fitted thereon the nuts *h*, as shown.

The shank D' of each blade is fitted to one of the radial holes *g'*, and has fitted to its inner end the circular collar *i*, which may be threaded and screwed upon said shank or have a smooth fit thereon; but whether the hole through it is smooth or threaded said collar, when adjusted to the proper distance from the peripheral end of the blade D, is firmly secured to said shank, so as not to be revoluble thereon, by a set-screw or pin *i'*, as shown. By this method of securing the blades in the hub C the angle or pitch of said blades may be readily increased or diminished without changing the distance from the center of said hub to the peripheral end of said blades by simply loosening the nuts *h*, turning said blades about the axes of their shanks, and then screwing down said nuts *h* hard upon the bosses *g*. This is a very valuable feature of my invention, for the reason that it is very desirable to have the peripheral ends of the fan-blades revolve as close to the inclosing-casing as practical without coming in contact with the same; but when the shanks of the blades are screwed into the bosses of the hub, as heretofore practiced, if the blades revolve as closely as desirable to the casing and it was desired to change the angles of the blade, it could not be done without lengthening or shortening the distance from the center of the hub to the outer end of the blades with the danger of greatly affecting the oper-

ation of the fan by causing the ends of the blades to strike the casing or removing them too far therefrom. The fan-blades revolve about the axis of the shaft B in the direction indicated by the arrows shown in connection with the several views of the drawings.

The several blades D D are set in the hub C, so that their ends are oblique to the axis about which they revolve, and are curved in the direction of their widths with a varying degree and kind of curvature at different distances from their inner ends, so that while the centers of their widths are straight radial lines their anterior and posterior edges are curved longitudinally or in the direction of their radial lengths, but with a different degree and kind of curve.

Each blade D is curved transversely on the line 2 2 of Fig. 4, or at about one-third of the length of said blade from its inner end to an arc of a circle, as shown in Fig. 7, which curve may have a greater or less radius, according to the requirements of the place where the fan is to be used.

That portion of the blade which is outside of the line indicated above, instead of being curved throughout to an arc of a circle, has that portion to the right of the center line 4 4 on Fig. 4 curved to a constantly varying and increasing curve, as indicated in Figs. 3 and 6.

That portion of the blade outside of the line 2 2 and to the left of line 4 4 and that portion inside of the line 2 2 and to the right of line 4 4 (see Fig. 4) are curved to arcs of the same radius as the curve on line 2 2. The inner left-hand corner *j* of each blade is curved in the opposite direction, so that the inner end of the blade has a cross-section, as shown in Fig. 8. By this form of blade a much more effective result is produced than can be produced by a flat blade or a blade

curved to arcs of uniform radii, as heretofore practiced.

What I claim as new, and desire to secure by Letters Patent of the United States, is—

1. In an exhaust-fan, a blade having its operating-face concaved transversely and increasing in curvature from the center of its width to its posterior edge and from a point about one-third of its length from its inner end to its outer posterior corner.

2. In an exhaust-fan, a blade having its operative face concaved transversely and increasing in curvature from the center of its width to its posterior edge and from a point about one-third of its length from its inner end to its outer posterior corner, and having its inner anterior corner curved in an opposite direction.

3. In an exhaust-fan, a series of screw-blades concaved transversely and having a progressively-increasing pitch for about two-thirds (more or less) of their lengths from their outer or peripheral ends inward, and having their inner anterior corners curved in the reverse directions.

4. In an exhaust-fan, the combination of the hub C *g*, provided with the radial holes *g'* and the slots *g''*, the blade D, provided with a threaded shank, a collar firmly secured to the inner end of said shank within a slot *g''*, and a nut fitted upon said shank and arranged to bear upon said hub C *g* to clamp said blade in position.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, on this 28th day of February, A. D. 1889.

JEFFERSON YOUNG.

Witnesses:

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