

(No Model.)

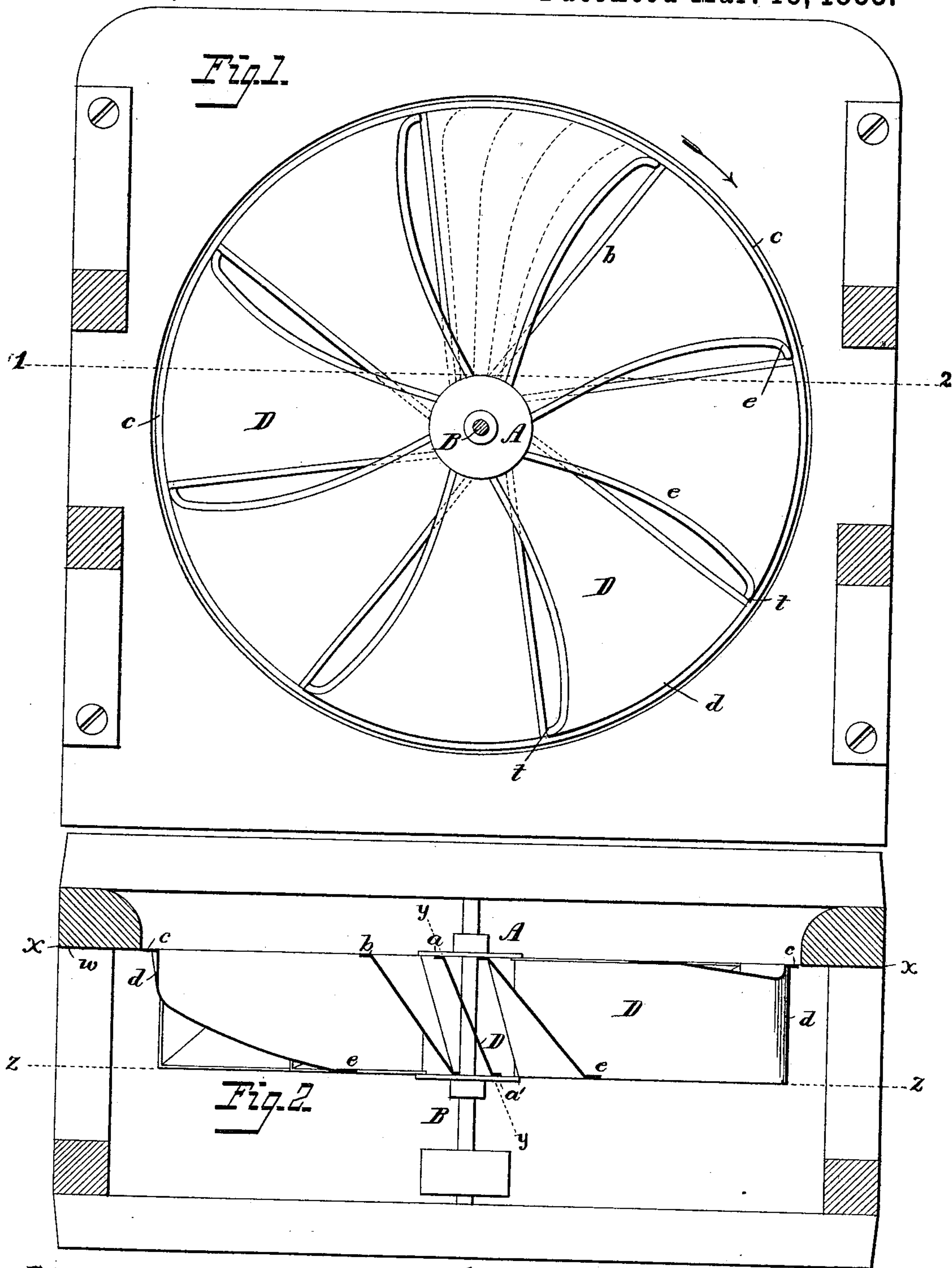
2 Sheets—Sheet 1.

J. M. BLACKMAN.

VENTILATOR.

No. 273,805.

Patented Mar. 13, 1883.



Attest:
Courtney & Cooper.
William Paston

J. M. Blackman Inventor:
By Charles E. Foster
his attorney

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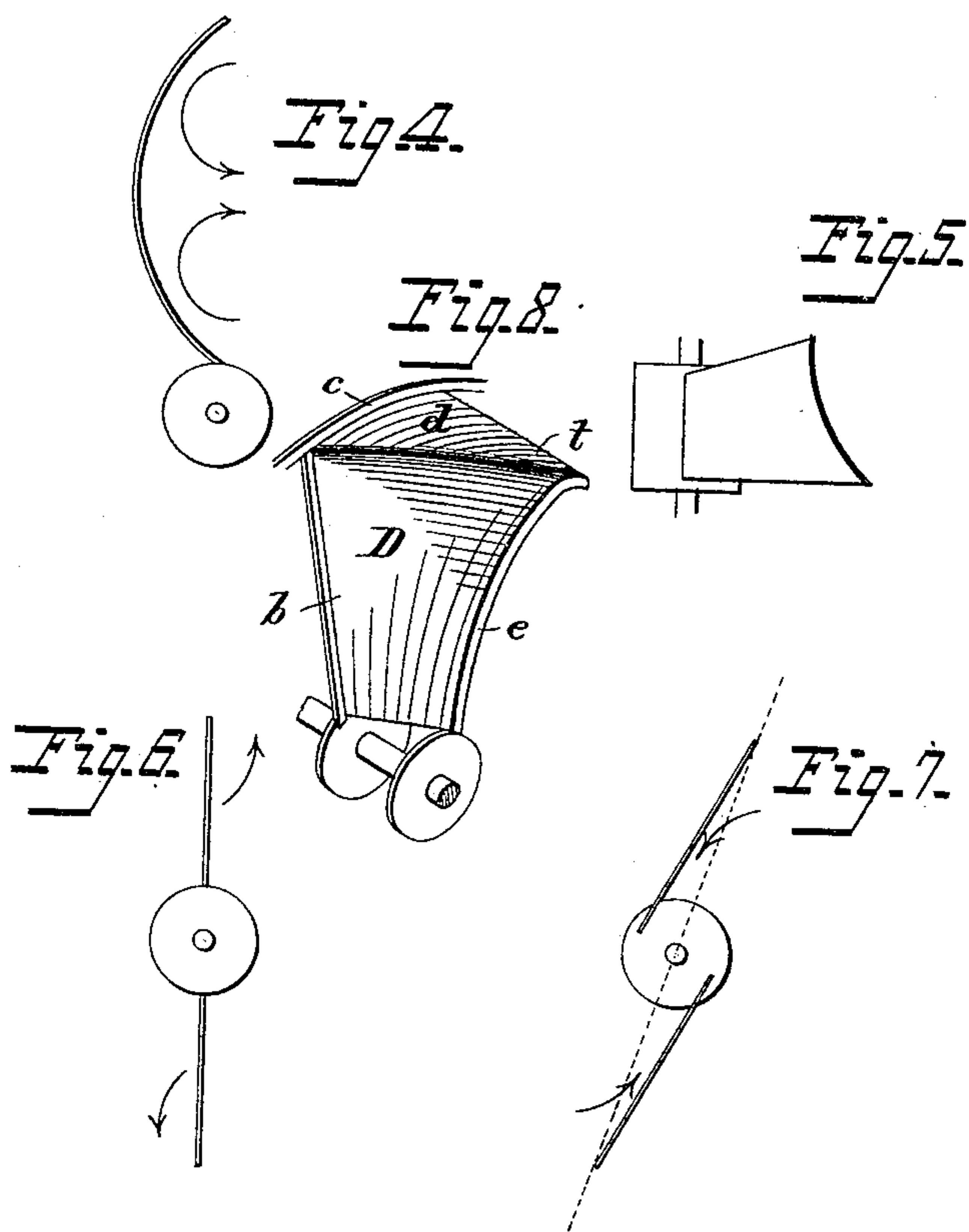
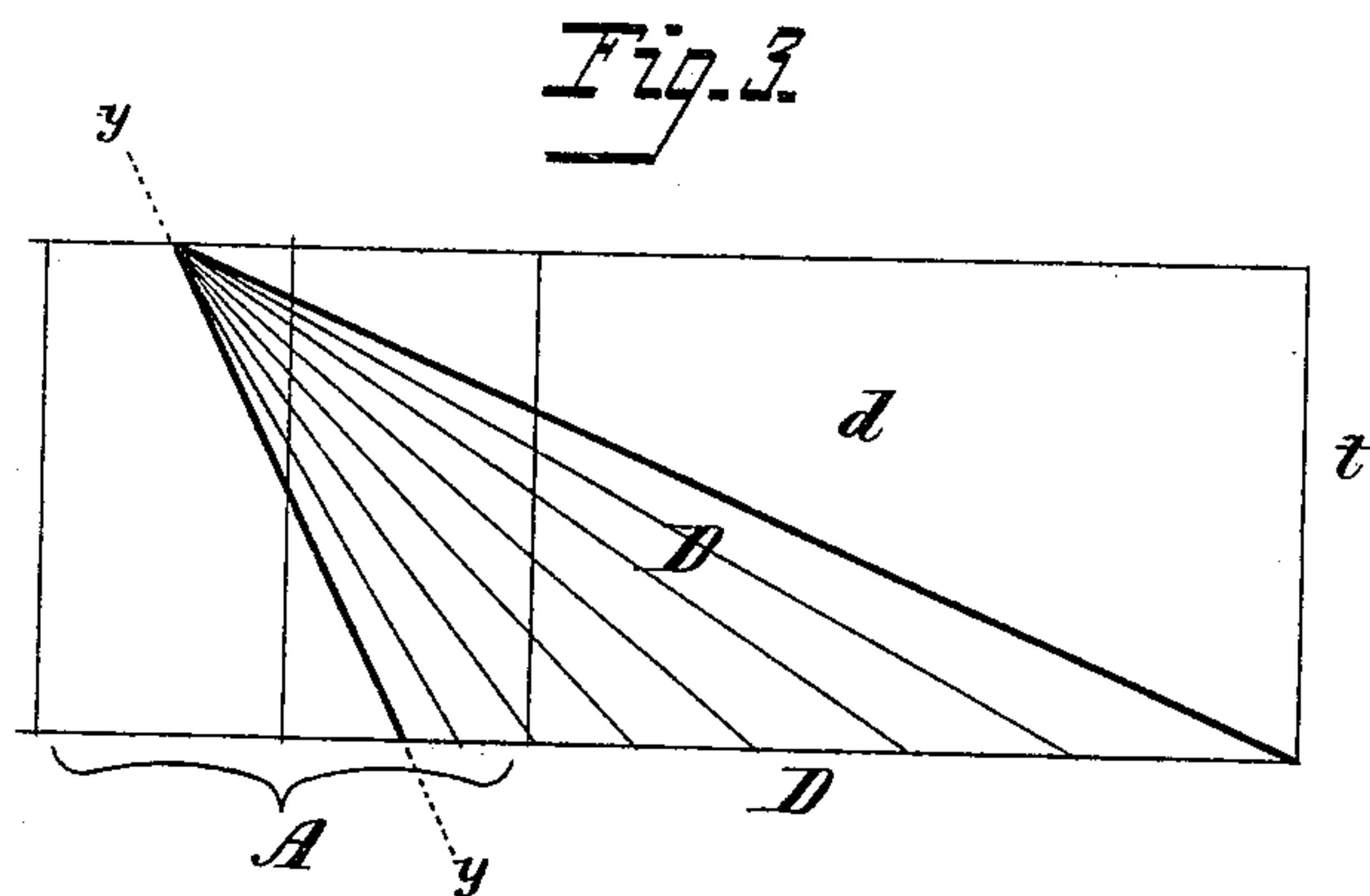
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VENTILATOR.

No. 273,805.

Patented Mar. 13, 1883.



Attest:
Courtney A. Cooper
William Paxton

J. M. Blackman **INVENTOR:**
By Charles E. Foster
his Attorney

UNITED STATES PATENT OFFICE.

JAMES M. BLACKMAN, OF CHICAGO, ILLINOIS.

VENTILATOR.

SPECIFICATION forming part of Letters Patent No. 273,005, dated March 13, 1883.

Application filed July 13, 1882. (No model.)

To all whom it may concern:

Be it known that I, JAMES M. BLACKMAN, of Chicago, Cook county, Illinois, have invented an Improved Ventilator, of which the following is the specification.

My invention is a ventilating-fan constructed, as fully described hereinafter, so as to rapidly transmit motion to large volumes of air, carrying the same in solid columns without dispersing it or creating back currents.

In the drawings, Figure 1 is a rear view of a ventilating-fan with my improvements. Fig. 2 is a section on the line 1 2, Fig. 1. Figs. 3 to 7 are diagrams illustrating the formation of the blades; Fig. 8, a perspective view of a blade and the hub.

In experimenting with that class of fans used to put air in motion for ventilating and other purposes, I ascertained that in ordinary constructions, while volumes of air would be driven forward by the revolution of the fans, other volumes would be thrown off radially, and still others would be thrown backward instead of forward, as desired, creating currents interfering with the free flow of air to the fan. After many experiments I ascertained that by bending each blade outward at the upper end, forming peripheral sections, the radial flow of the air might be prevented, thus compelling the large volumes ordinarily dissipated in this direction to move directly forward. This feature constitutes the subject-matter of a separate application for Letters Patent.

My present invention relates to certain improvements (not specified in the aforesaid application) whereby I have succeeded in preventing altogether any backflow, insuring a forward propulsion of all the air coming within the influence of the wheel.

In the course of my experiments I ascertained that it was necessary to so construct each blade of the wheel as to draw or deflect outward the air from the forward edge of every portion of the blade, and to set every portion or face of the blade at such an angle that the forward edge at every point would "cut under" the air rather than move it laterally or carry it with the wheel, and that while portions of the blade might be so bent as to throw the air outward, other portions, if not properly

shaped, would draw it back, creating counter-currents. I found that to prevent such results it was essential to vary the angle and curve of the blade at different points, and that although such angles and curves would be different, according to the sizes of the wheels and number of blades, there were certain definite and specific proportions and forms common to all, which result in much improved effects, and which I will now specify.

The hub A of the wheel may be solid, or may consist of disks *a a'*, secured to the shaft B. From the hub extend radial ribs *b*, which meet an annular rim, *c*, and said ribs constitute the straight edges of the blades D, the rim *c* and ribs being all in the same vertical plane *x*. The diameter of the hub A and the depth of the wheel should, to secure the best results, be about equal to one-sixth of the diameter of the wheel, and the ribs or edges *b*, instead of being radial, should coincide with lines extending from the periphery, through the hub, midway between the axis and periphery of the latter. The blades, instead of being set with their inner ends parallel to the axis, join the hub upon lines *y y*, crossing the axial line at an angle at the center, and the forward edge of each blade corresponds to a curve which is gradually increased toward the outer end, the edges of all the blades being upon a plane, *z z*, parallel to the plane *x x*. Thus the forward edge of each blade may be a rib, *e*, extending from the hub nearly parallel for a short distance with the rib *b*, and then curved forward until it nears the periphery, when the curve is sharper, as shown. The body of the blade between the edges or ribs *b e* is gradually bent at an angle which becomes more and more obtuse to the axis of the shaft as it approaches the periphery, as shown in fine lines, Fig. 3, and is also bent from a perpendicular line, parallel to the edge *b*, as it recedes from said line toward the edge *e*, as shown in dotted lines, Fig. 1. At the periphery the blade is bent to form a peripheral section, *d*, that extends from the blade to the rim *c*, and has a forward edge, *t*, parallel to the axis of the shaft. This peripheral section may form part of the blade, or may be a separate piece riveted or otherwise secured thereto. If the blade were bent or hollowed from each end to the center, as shown by the outline, Fig.

4, the air collected by the ends of the blade, instead of being carried outward, would be drawn to the center and thrown backward in currents, interfering with the flow of air to the wheel; so, if the blade at any point, as at the hub, Fig. 5, is too nearly parallel with the axis of the shaft, the air, instead of being sent forward, will be carried round with the wheel, and the effect will not be proportioned to the power expended. By setting the blade at an angle to the axis, as shown in Fig. 3, by maintaining the portion near the hub comparatively flat, by bending the body beyond the center, and by giving a sharper curve thereto near the periphery, where it meets the peripheral section, as described, I have succeeded in preventing any backflow, and have with comparatively little power imparted movement to large volumes of air in one direction and in nearly solid columns. This effect is increased by setting the blade somewhat tangential to the axis, as described, instead of radially, the outer end thus being pitched forward, so as to draw in the air instead of dispersing it radially. This will be best understood on reference to diagrams Figs. 6 and 7, in which diagram 6 illustrates a radial blade which throws out the air by its revolution, while diagram 7 represents a blade set tangentially to the hub and tending to draw the air toward the latter. It will be evident that the ribs *b* may be flanges formed by bending the edges of the blades.

It is common to set ventilating-fans in openings in walls or frames, which completely sur-

round the peripheries of the fans and prevent any radial inflow of air. I set my fan back so that the front face will be nearly on the same plane as the inner face, *w*, of the wall or frame, as shown, thus permitting a free flow of air to the periphery. (See Fig. 2.)

I do not here claim the fan having blades set to give a forward pitch, as this will form the subject of a separate application for Letters Patent.

I claim—

1. A ventilating-fan provided with blades, each set upon the hub at an angle to the axis of the shaft, the outside edges of the blades being straight and the inside edges curved, the curve increasing at the periphery, and having peripheral sections extending from the bodies to the plane of the outside edges, substantially as set forth.

2. A ventilating-fan provided with blades, with the outside straight edges on one plane and inside curved edges on a parallel plane, the body of each blade being curved to meet a peripheral section, *d*, and the curve widening or extending from the outer edge to the inside, substantially as set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JAS. M. BLACKMAN.

Witnesses:

CHARLES E. FOSTER,
JNO. W. SIMS.