(Model.)

E. FOX.

VENTILATING WHEEL.

No. 383,217. Patented May 22, 1888.

Fig. 1

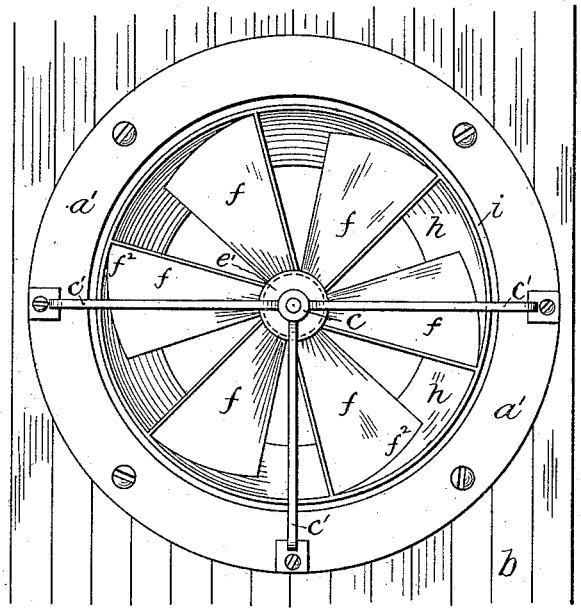


Fig. 2

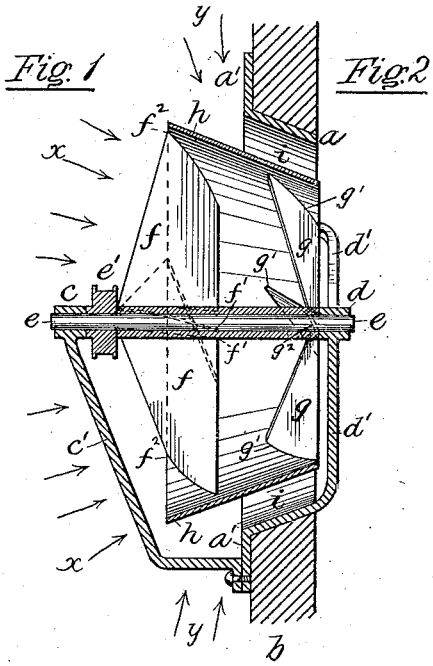


Fig. 3

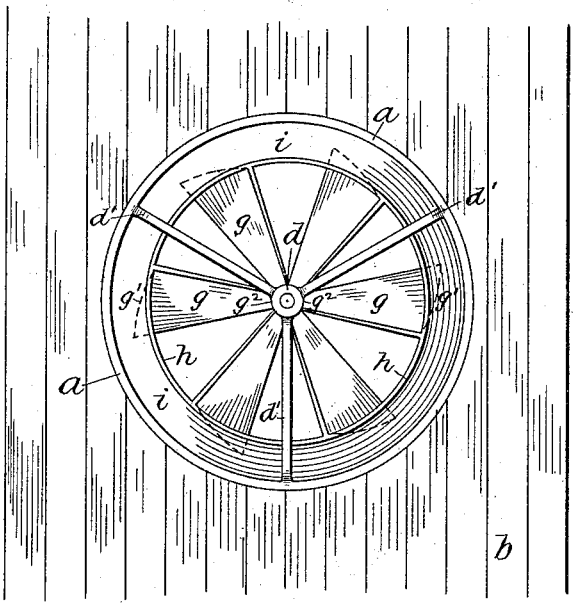
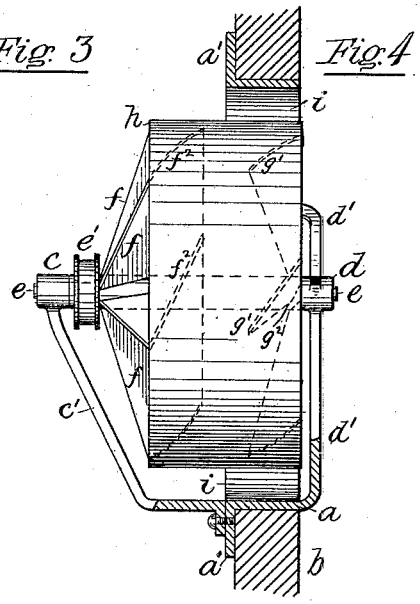


Fig. 4



Witnesses.

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UNITED STATES PATENT OFFICE.

EDWARD FOX, OF BROOKLYN, NEW YORK, ASSIGNOR OF ONE-HALF TO PATRICK REILLY, OF SAME PLACE.

VENTILATING-WHEEL.

SPECIFICATION forming part of Letters Patent No. 383,217, dated May 22, 1888.

Application filed February 25, 1887. Serial No. 228,831. (Model.)

To all whom it may concern:

Be it known that I, EDWARD FOX, a citizen of the United States, residing at Brooklyn, county of Kings, State of New York, have invented certain new and useful Improvements in Ventilating-Wheels, of which the following is a specification.

This invention relates to that class of ventilating devices in which the air is displaced by means of a rotating fan-wheel, and has for its object to increase the efficiency of such devices.

In my improved ventilating-wheel advantage is taken of the physical property a moving column of air or fluid possesses of causing the surrounding or adjacent air or other medium to move in the same direction with itself. A body or column of air issuing from an aperture creates a vacuum close to the aperture by reason of the adhesion between the moving column of air and the surrounding air. This vacuum is, of course, maintained at the expense of the energy which causes the air to issue through the aperture. Now, if the air be drawn from a room or chamber by means located in the aperture, and the place where the vacuum is formed be opened to the interior of the room or chamber, the air will be withdrawn therefrom in a steady stream and pass away with and increase the volume of the original moving column, passing through the aperture proper with but very little if any additional expenditure of power.

My invention embraces an improved form of wheel by which the above principle is practically applied. I will first broadly describe the same, and then point out the specific features of construction by referring to the accompanying drawings.

The fan-wheel is composed of radially-arranged inclined vanes secured to a central shaft and a metal shell surrounding the vanes, preferably conical in form. A frame provided with suitable bearings in which the shaft of the fan-wheel is fitted to rotate has a circular aperture corresponding to the form of the shell of the wheel, but somewhat larger than it, thus leaving an annular opening between the wheel-case and the frame. The vanes at the front or entrance end of the wheel extend outside the edge of the shell, and this part of the wheel projects beyond the frame, and at the exit end the faces of the wheel and frame are about in line, so that the air which is caused to flow through the annular opening by the action of the column of air issuing from the fan-wheel is drawn from the room or building in lateral directions toward the wheel. Thus the air in the rooms is caused to move toward the wheel over a greater area, and consequently with more freedom, than by the use of fan-wheels as at present made. To further increase the efficiency of this combined pressure and exhaust fan-wheel, I propose to place two sets of vanes in the conical casing—one set at the entrance and the other set at the exit end—and to so form the vanes at the entrance end that the air is concentrated by them within the wheel and so form the vanes at the exit end that it is to a certain extent discharged laterally, or the column of air is caused to spread out as it issues from the wheel, thereby giving it greater attractive action to draw the air through the annular opening as it passes over the exit end thereof.

Figure 1 of the drawings represents the front or entrance end of my improved ventilating-wheel. Fig. 2 is a vertical central section of the same. Fig. 3 is a view of the rear or exit end, and Fig. 4 shows a modification.

The frame *a* is fitted into an opening formed through the wall or partition *b* of the room or building to be ventilated. It is preferably made of cast metal, and is provided with a flat flange, *a'*, by means of which it is secured to the wall or partition. Two central bearings, *c* and *d*, are located, respectively, at the front and rear sides of the frame *a*, being held in position by the spider-arms *c'* and *d'*.

In the bearings *c* and *d* is fitted to rotate the shaft *e* of the fan-wheel, provided with suitable gearing by which it is connected to the source of power, shown in the drawings as a pulley, *e'*, around which a driving-belt may be placed, as ordinarily. To the shaft *e* or to a hub or hubs thereon are secured the inner ends of the two sets of vanes *f* and *g*, and to the outer ends of these vanes is fastened the shell *h*, (shown in Figs. 1, 2, and 3,) conical in form and corresponding in shape to opening in the frame *a*, but less in diameter than said opening, thus leaving an annular air-space,

i, of considerable area between the shell and the opening. The shell *h* of the fan-wheel is of greater depth than the opening in the frame *a* and is arranged with its rear end about in line with the rear face of the frame *a*, thus leaving the front or entrance end of the wheel projecting beyond the front face of the frame.

The number and form of the vanes in the fan-wheel may be varied at pleasure to suit the requirements of the case, and one set of vanes may be used instead of two sets; but I prefer, for the following reasons, to use two sets of vanes, *f* and *g*, as shown, and arrange the front set, *f*, to extend at their central parts beyond the edge of the shell *h* and so shape them that the working-angles are greater at their central parts, *f'*, than at their outer edges, f^2. By this construction the air is drawn toward the wheel in currents moving in all directions sidewise to the moving mass of air directly in front of the wheel, as indicated by the arrows *x x*, and is concentrated in the central part of the wheel, and would issue from the wheel at great velocity in a compact column if not further acted upon by the other set of vanes, *g*. The conical shell *h* also assists in directing the air toward the axial line on which the wheel rotates. The vanes *g*, located at the rear or exit end of the fan-wheel, are so shaped as to act on the air sent forward through the shell *h* by the vanes *f* and cause the column of air as it issues from the wheel to spread out, so that it moves to a certain extent laterally over the outer end of the annular opening *i*, thus acting more efficiently to exhaust or draw the air through said annular opening. This extra discharge of air is supplied from the room principally by currents moving laterally toward the inner side of the annular opening, as indicated by the arrows *y y*. The spreading action of the vanes *g* on the issuing column of air is accomplished by making the working-angles of their outer edges, *g'*, greater than those of their central parts, g^2.

As before stated, the internal construction of the fan-wheel may embody any device adapted to displace air from one side of the wheel to the other side. The shell *h* of the wheel and the opening *i* in the frame *a* may be cylindrical in form, as shown at Fig. 4. In this view of the modified ventilating fan-wheel made according to my invention the cylindrical wheel *h* is shown in full and the frame *a* in section. All parts corresponding to those of the other views are similarly marked with indicating-letters, so that its general construction and operation will be fully understood by what has gone before.

It is obvious that these improvements in ventilating fan-wheels may be combined with a conduit in the ordinary manner when it is desired to draw air from a distance.

Having now described my invention, what I claim, and desire to secure by Letters Patent, is—

1. The combination, with a fan-wheel composed of a peripheral shell and vanes located thereon, of a frame having an opening in which the wheel rotates, larger than the wheel, thereby forming an independent annular passage through which the air is drawn by the action of the column of air forced through the fan-wheel.

2. The combination, with a fan-wheel composed of a series of radially-inclined vanes and a casing surrounding them, of a frame of less depth than the wheel and provided with bearings in which the shaft of the wheel is held, said wheel being so located that the front or entrance end of the same projects beyond the frame and the rear or exit end is about in line with the rear end of the frame.

3. A fan-wheel composed of a series of inclined radial vanes and a conical shell surrounding the vanes, in combination with a frame having a conical opening, said opening being considerably larger than the wheel, thus leaving an annular space between them, and bearings on the frame in which the wheel is held and rotated, substantially as set forth.

4. In a fan-wheel, in combination, a central shaft, two sets of vanes, and a shell surrounding them, the front or entrance set of vanes being formed with their central parts less inclined to the axis than their outer edges, and the rear or discharging vanes being formed with their outer edges less inclined to the axis than their central parts, substantially as set forth.

5. A fan-wheel composed of two sets of vanes secured to a central shaft, the rear set of vanes being of less diameter than the front set, and a conical shell secured to the outer edges of the two sets of vanes, in combination with a frame having an opening corresponding in shape with but larger than the conical shell and provided with bearings in which the shaft of the wheel is held, substantially as set forth.

6. The combination of a conical fan-wheel having a set of vanes at its front or entrance end extending outside the wheel and having their working-angles greater at the center of the wheel than at the periphery, so as to concentrate the air in the central parts of the wheel, and a set of vanes located at and in line with the exit end of the wheel and having their working-angles greater at the periphery of the wheel than at the center, so as to spread out the column of air or discharge it laterally as it issues from the wheel, with a frame having a conical opening larger than the outside of the conical wheel and provided with bearing-supports in which the wheel is held and rotated, substantially as set forth.

Signed at New York, county and State of New York, this 23d day of February, 1887.

EDWARD FOX.

Witnesses:
PATRICK REILLY,
H. D. WILLIAMS.