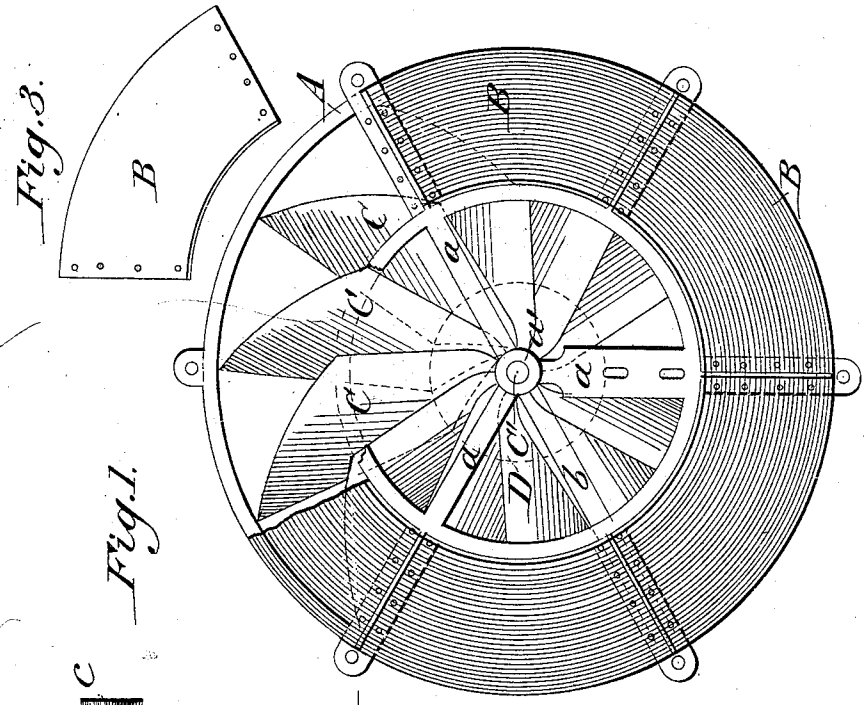
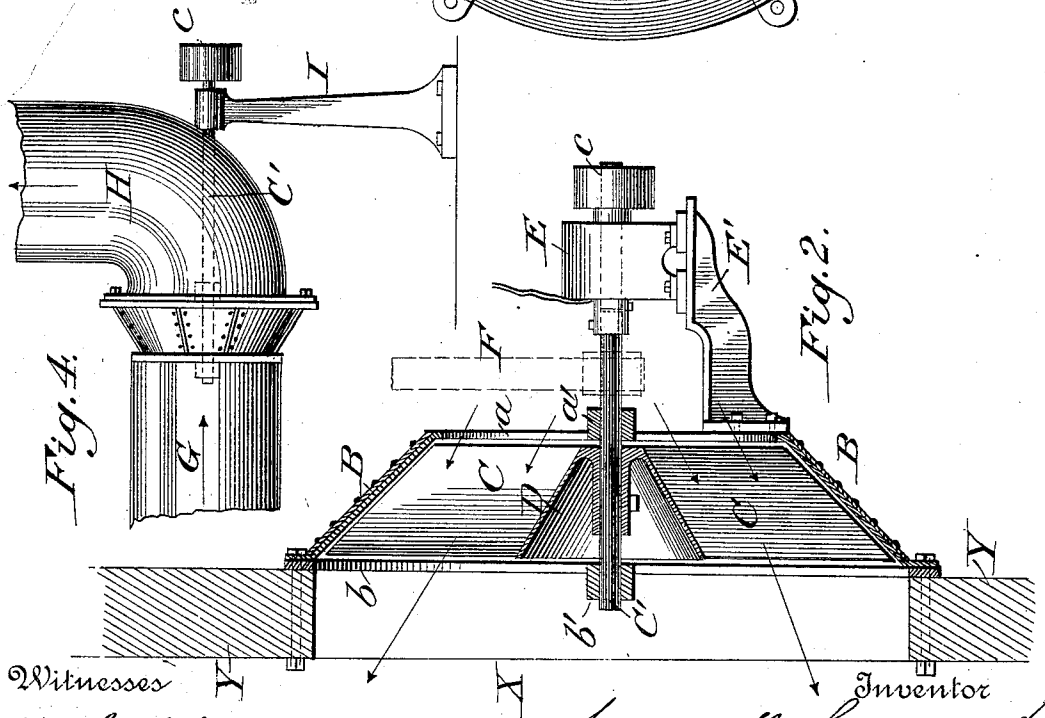
(No Model.) 2 Sheets—Sheet 1.

J. M. SEYMOUR, Jr.

EXHAUST FAN.

No. 420,470. Patented Feb. 4, 1890.





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(No Model.) 2 Sheets—Sheet 2.

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Fig. 5.

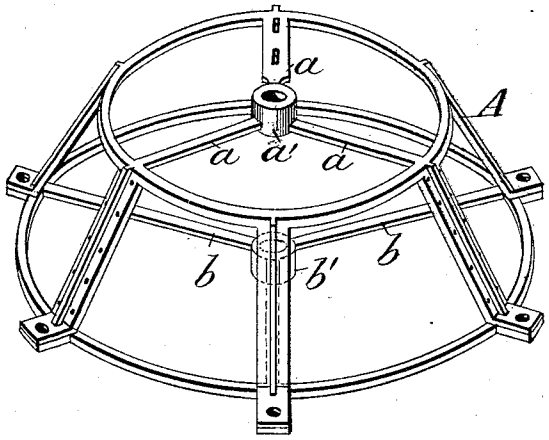


Fig. 6

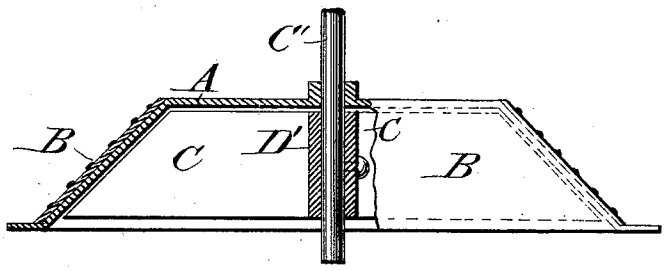
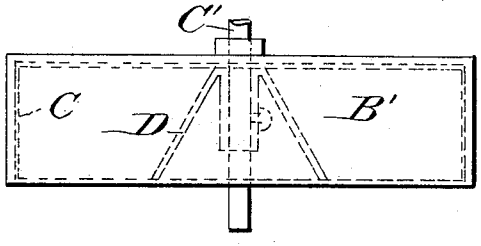


Fig. 7.



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UNITED STATES PATENT OFFICE.

JAMES M. SEYMOUR, JR., OF NEWARK, NEW JERSEY.

EXHAUST-FAN.

SPECIFICATION forming part of Letters Patent No. 420,470, dated February 4, 1890.

Application filed March 21, 1888. Serial No. 267,925. (No model.)

To all whom it may concern:

Be it known that I, JAMES M. SEYMOUR, JR., a citizen of the United States, residing at Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Exhaust-Fans; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to an improvement in the construction of exhaust-fans, the object being to utilize the full force of the blast generated in the revolution of the fan by avoiding any possibility of return or back currents of air near the periphery and center of the wheel, commonly produced with the ordinary form of fans and resulting in loss of power and a diminution of the air-current; and the invention consists, essentially, in a fan or wheel whose blades or vanes are of such an outline that the wheel will be shaped in general after the manner of a conical frustum; also, in a casing or box for the wheel corresponding in general conical shape thereto, so as to be adapted to contain it, the width of said casing from front to rear being considerably less than its diameter across its face; also, in a conical hub for the fan-wheel, substantially as described; and, furthermore, the invention comprises certain details and peculiarities in the construction, arrangement, and combination of parts, substantially as will be hereinafter fully described and claimed.

In the annexed drawings, illustrating my invention, Figure 1 is a front elevation of my improved exhaust-fan and the conical casing that surrounds it, a portion of the latter being broken away to better show the fan-blades. Fig. 2 is a vertical cross-section of the same, showing the fan located in the wall of a building and actuated by a dynamo-electric machine. Fig. 3 is a detail view of one of the plates of which the fan-casing is composed. Fig. 4 is a view showing my improved fan provided with a conduit or channel for collecting the current or blast after it has been generated. Fig. 5 is a perspective of the frame for the casing. Figs. 6 and 7 represent modifications.

Similar letters of reference designate corresponding parts in all the figures.

In rotary exhaust-fans of the common and most usual construction the fan revolves within a cylindrical box, the ends of the fan-blades being parallel to the wall of the box and moving in close proximity thereto, and the wheel partaking, in consequence, of a cylindrical form. With this structure and arrangement the best results are not attainable. This is due to the fact that the centrifugal force causes a certain amount of air which has entered the wheel to be driven back as a receding current near the periphery instead of passing through the wheel. In addition to the loss of air by this peripheral back-current, the common construction of wheels involves another disadvantage, in that a back-pressure is created by the incoming of air from without near the center of the wheel. It becomes a great desideratum, therefore, in the structure of the wheel to prevent this loss of air and this obstruction to the free working of the fan, and on the other hand to oblige every cubic inch of air that enters the wheel to pass through it. My object, therefore, is to avoid these disadvantages by altering the common structure so as to cut off the peripheral back-current and permit the centrifugal force to act in unison with the propelling, and also to overcome the back-draft in opposition to incoming currents. This is accomplished by inclining the wall of the fan-casing inwardly or in a direction opposite to that in which the air passes through it, the diameter of the air-ingress end of the said casing being less than the diameter of its air-egress end. In this way that portion of the ordinary casing where the peripheral back-current takes place is done away with by being cut off, so to speak, and thus the return-current avoided. Furthermore, the fan-blades are made to correspond with the change in the casing. The fan is also provided with a conical hub whose sides correspond in general direction with the inclined wall of the fan-casing. The base of the cone, if it be solid, or its interior, if it be hollow, is interposed in the path of outside incoming air-currents, preventing them from entering the fan and effectually stopping a back-draft.

Such being a general description of the essential ideas of my invention, I will proceed to describe the detailed structure which I have selected and exhibited in the drawings, by way of example only, as one mode of carrying out my invention.

A designates the skeleton frame-work of the fan-casing, said frame being constructed to afford a proper inclination for the wall of the casing and being adapted to receive sections or plates B B, which are riveted or otherwise attached thereto. The series of plates B B constitute, when fixed in place, the inclined wall of the fan-casing, which latter has the general form of a hollow conical frustum. I prefer to make the casing sectional, as stated, it being easier of construction than one made in a single piece, especially since the walls are inclined.

C′ denotes the shaft of the fan or wheel, around which are arranged the obliquely-set elongated radial vanes or blades C. The shaft C′ is supported in bearings a' and b', said bearing a' being located at the junction of the radial arms $a\ a\ a$, fastened to that side of frame A having the lesser diameter, and said bearing b' being located at the junction of arms $b\ b$, which are attached to that side of frame A having the greater diameter. (See Fig. 2.)

The fan-casing is designed to be located vertically at any desired point in a building—as, for instance, opposite the opening X in a wall Y, as shown in Fig. 2. The casing is secured to the wall by bolts passing through projections on the casing-frame and entering the wall near the opening X. A fan thus located can be used for the purpose of cooling or purifying the atmosphere of a room or other apartment.

In order to conform the fan to the shape of the inclined casing, the end of each blade C will be cut off at an angle, as shown, so that the edge may be parallel to the casing and capable of moving in proximity thereto during the revolutions of the fan. Further, the fan is provided with a conical hub D, secured on shaft C′, the side of the cone being substantially parallel to the casing. I am limited to no special angle of inclination for the casing; neither am I confined to an exact parallelism of casing and conical hub; but I reserve the liberty of varying the structure in those respects, and explicitly state that the casing may have any desired inclination and that the conical hub may or may not be correspondingly inclined. Said hub D may be hollow or solid. It effectually prevents the entrance into the fan of those currents of air which tend to rush into it from without when it is rapidly rotated. This tendency of the incoming air is analogous to the action of a mass of water, which, when rapidly rotated, shows a depression at the center of the surface of rotation. This tendency in the case of a fan creates a back-pressure which interferes with its easy working. It is effectually avoided, however, by the use of the conical hub.

Any suitable actuating power may be used to drive the fan. An electric dynamo, as shown at E, Fig. 2, is a convenient means. It is supported on a bracket E′, bolted to one of the arms a, said arm being furnished with openings, as shown, for the reception of the bolts. I have shown at F, moreover, in Fig. 2, a belt-connection with the fan-shaft C′, so that when desired the shaft may be driven by said belt instead of by the dynamo. In Fig. 4 the fan-casing and fan are represented on a diminished scale, and in conjunction with them are shown two pipes, one G serving as an induction-pipe to carry air to the fan, and the other H as an eduction-pipe to carry air away therefrom for any purpose or use. The pipe H is curved and the fan-shaft C′ is carried through the wall of the pipe and supported exteriorly thereto at one end by means of a standard I. The end of the shaft is furnished with pulley c for the application of a driving-belt. Said pulley c is seen also in Fig. 2. Fig. 4 therefore shows only a modification in the arrangement of the fan or blower to adapt the same for new uses.

A machine constructed in accordance with the principles of my invention, as above described, may be used for forcing either air or liquids.

In Figs. 6 and 7 are shown modifications in the structure of the casing and also of the hub. In Fig. 6 I still have the cone-shaped hollow casing. The hub, however, is not cone-shaped, like the hub D, but is straight, as at D′. Thus it will be observed that a straight hub may be used beneficially with the conical casing. Furthermore, in Fig. 7, instead of having the casing with the inclined walls, I have the walls straight and the casing consequently of cylindrical form, as at B′. The hub, however, is not straight, but is cone-shaped.

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

In an exhaust-fan, the combination of the conical casing, the rotary fan composed of radial vanes or blades whose ends are inclined, so as to be parallel to the casing, the driving-shaft, and the conical fan-hub thereon, the width of said casing from front to rear being considerably less than its diameter across the face, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

JAMES M. SEYMOUR, JR.

Witnesses:

L. A. ZIEGLER,

MARCUS NORRIS.