(No Model.)

W. J. BALDWIN.

CENTRIFUGAL FAN.

No. 556,453. Patented Mar. 17, 1896.

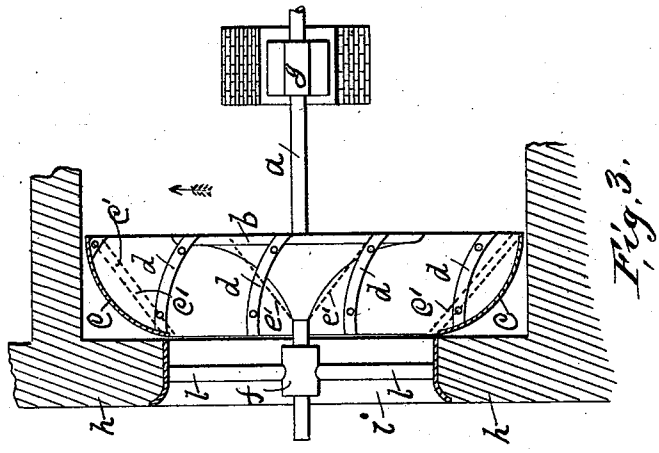

Fig. 3.

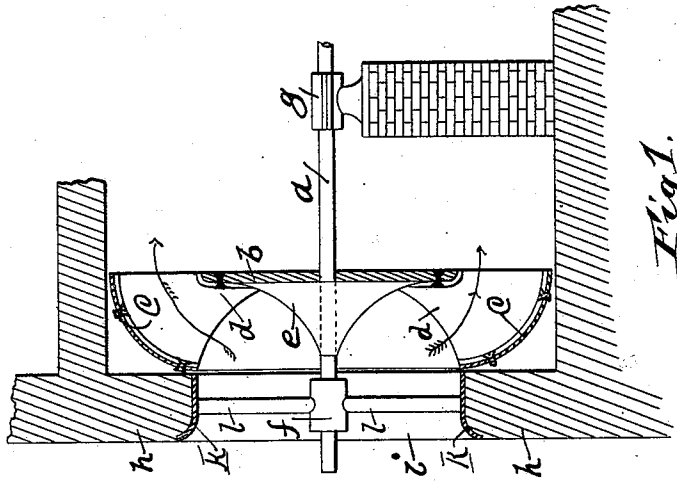

Fig. 1.

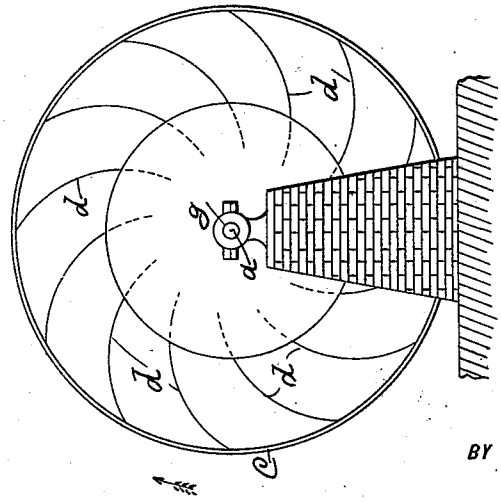

Fig. 2.

WITNESSES:

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WILLIAM J. BALDWIN, OF BROOKLYN, NEW YORK.

CENTRIFUGAL FAN.

SPECIFICATION forming part of Letters Patent No. 556,453, dated March 17, 1896.

Application filed February 19, 1895. Serial No. 539,028. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM J. BALDWIN, a citizen of the United States, and a resident of the city of Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Centrifugal Fans, of which the following is a specification.

My invention relates to improvements in centrifugal fans, and the object of the improvement is to increase the efficiency of the fans by providing them with a deflecting-shell around the outer edges of the blades, by which the air is deflected from a direction tangential to the axis of rotation to a direction parallel thereto, and this shell is preferably combined with a cone around the axis of rotation to provide an easy passage for the air through the fan.

As is well understood, centrifugal fans first receive the air by a central orifice into the spaces between the blades and then by the revolution of the fan put that air into rapid rotary motion. The air thus rotated acquires a centrifugal tendency depending on the velocity of rotation, and in the common type of fan flows from the spaces between the blades in a direction tangential to the rotation.

The efficiency of the centrifugal fan is theoretically very high; but it is much reduced in practice by the fact that the air after issuing from the fan has to be turned to a direction at right angles to its original direction, because the limits on the space allotted to the fan in buildings and other conditions of its practical operation prevent setting the fan in such position that its tangents coincide with the direction in which the air must be delivered. Heretofore the air has been thus changed in direction by causing it to strike a fixed wall of the chamber adjacent to the fan, by which the air is turned to a direction parallel to the axis; but the losses due to the friction of the air-currents striking at a high velocity against a rough fixed surface and to the back-pressures, eddies and breaking up and confusion of the air-currents are very large and seriously reduce the efficiency of the fan.

It is the purpose of this invention to substitute for the fixed wall a deflecting-shell which forms a part of the fan and revolves with it. The effect now is that in place of the air-currents striking a fixed surface a thin layer of condensed air forms against the inner surface of the shell when once the air has attained the velocity of rotation of the fan, which layer itself flows steadily outward over the surface of the shell, and the main body of the air in the spaces between the blades slides by this layer with very little friction, while eddies are practically overcome. The result is that such a fan possesses an efficiency much in excess of ordinary centrifugal fans. This deflecting-shell in centrifugal fans is the essential element of my invention.

Referring to the drawings which accompany the specification to aid the description, Figure 1 is a vertical section through the axis of the fan, but showing the shaft and cone in elevation. The arrows show the course of the air. Fig. 2 is an elevation of the delivery side of the fan. Fig. 3 is a top view of the fan, the upper half of the shell being removed to show the slope of the blades.

a is the shaft, turning in bearings and driven in any suitable manner; *b*, a vertical disk fixed on the shaft *a*. The diameter of said disk *b* is less than the extreme diameter of the fan. A cone *e*, preferably with concave slope, as shown, is fixed on the inlet side of the disk *b*, the shaft *a* passing through said cone. A deflecting annular shell *c*, open at front and back, forms the periphery of the fan, being bolted to the flanges on the outer edges of the blades *d*, said blades *d* being bolted at their inner flanges to the cone *e*, as is clearly shown in Fig. 1. The said blades *d*, as seen in elevation, Fig. 2, curve backward outwardly, and also, as seen in top view, Fig. 3, preferably curve or incline to the direction of the axis. Thus the said blades *d* not only put the air in rapid rotation, but also exert on it a backward pushing action like that of a propeller in water.

Immediately in front of the fan is arranged a wall *h*, with a cylindrical air-inlet orifice *i*, the diameter of which is about equal to the diameter of the opening in the front of the shell *c*. A casting or frame *k* is fitted around the sides of the orifice *i*, which is preferably

rounded outwardly, as seen in Fig. 1. Said frame *k* both provides a smooth surface for the inlet or fill and offers the means for supporting the rods *l l*, which carry the bearing *f* of the shaft *a*.

I prefer to make the diameter of the orifice *i* a very little greater in the clear than the diameter of the disk *b* and to give to the shell *c* and to the slope of the cone *e* such curves that the air-passages between the blades *d* have the slope of double elbows of easy curvature, as indicated in Fig. 1.

In operation when the fan is rapidly revolved the blades *d* soon communicate to the air between them the same velocity of rotation as the fan itself has. This rotation of the air generates a centrifugal force, which causes the air to press violently outward and to flow toward the largest diameter of the shell *c*, being deflected by the slope of the shell, so that finally it issues from the spaces between the blades in a direction parallel to the axis of rotation. At the same time the outward tendency of the air has generated a partial vacuum in the space within the inner edges of the blades *d*, and thus air is continually drawn into the fan through the inlet-orifice *i*. As long as the fan revolves there is a continual flow of air through the fan.

While I prefer to form the cone *e* with concave slope and the shell *c* with a curve from front to back, as shown, yet I can also form said cone with a straight slope, as indicated by *e'*, Fig. 4, and the shell as a frustum of a cone *c'* with straight sides, without departing from the essence of the invention.

Now having described my improvements, I claim as my invention—

1. A centrifugal fan provided with a revoluble disk *b* at the back and of smaller diameter than the extreme periphery of the fan, a revoluble shell *c* having an air-inlet orifice in its front side and increasing in diameter from its front to its back side substantially as shown, and blades extending from the disk *b* to the shell *c* and having their entrance sides substantially parallel to the axis of rotation and their outlet sides bent backwardly and at an angle with the axis of rotation, substantially as and for the purpose described.

2. The combination in a centrifugal fan of a revoluble disk *b* at the back of the fan and of smaller diameter than the extreme diameter of the fan, a cone on the front side of the disk, a revoluble peripheral shell *c* having openings at its front and rear sides and increasing in diameter from its front to its rear side, and blades *d* extending from the disk *b* to the shell *c* and having their entrance sides substantially parallel with the axis of rotation and their outlet sides bent backwardly and at an angle with the axis of rotation, substantially as and for the purpose described.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of two witnesses, this 4th day of February, 1895.

WILLIAM J. BALDWIN.

Witnesses:
BERNARD J. WECKE,
H. V. BROWN.