W. J. MONTGOMERY.

FAN BLOWER.

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1,136,827.

Patented Apr. 20, 1915.

Fig. 1.

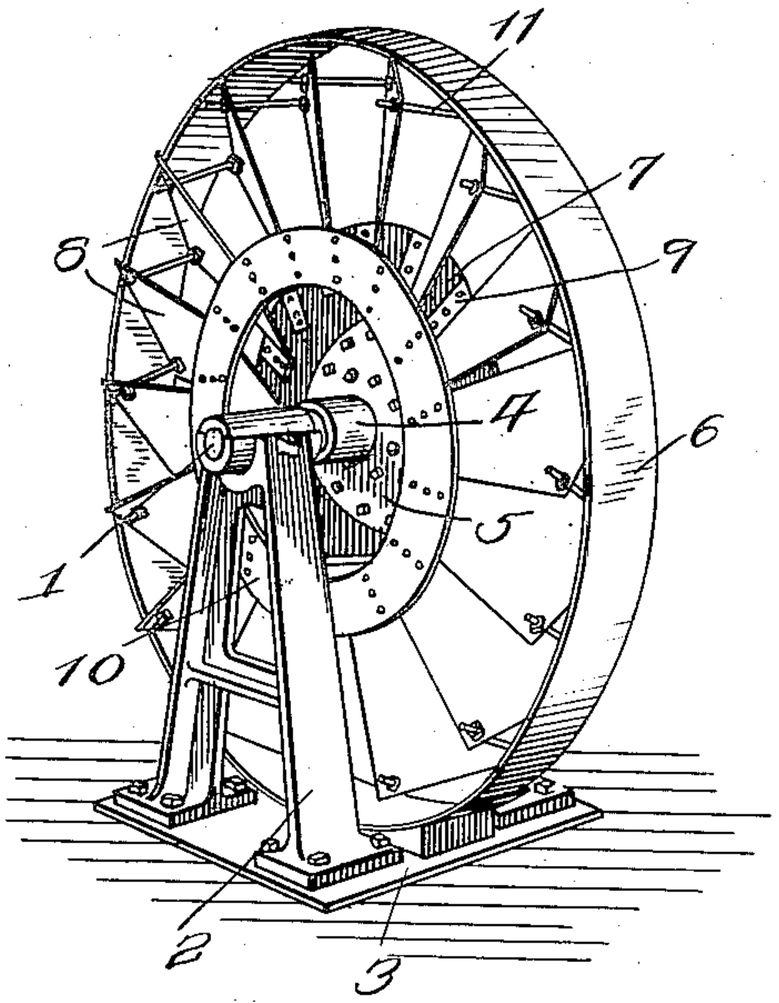


Fig. 2.

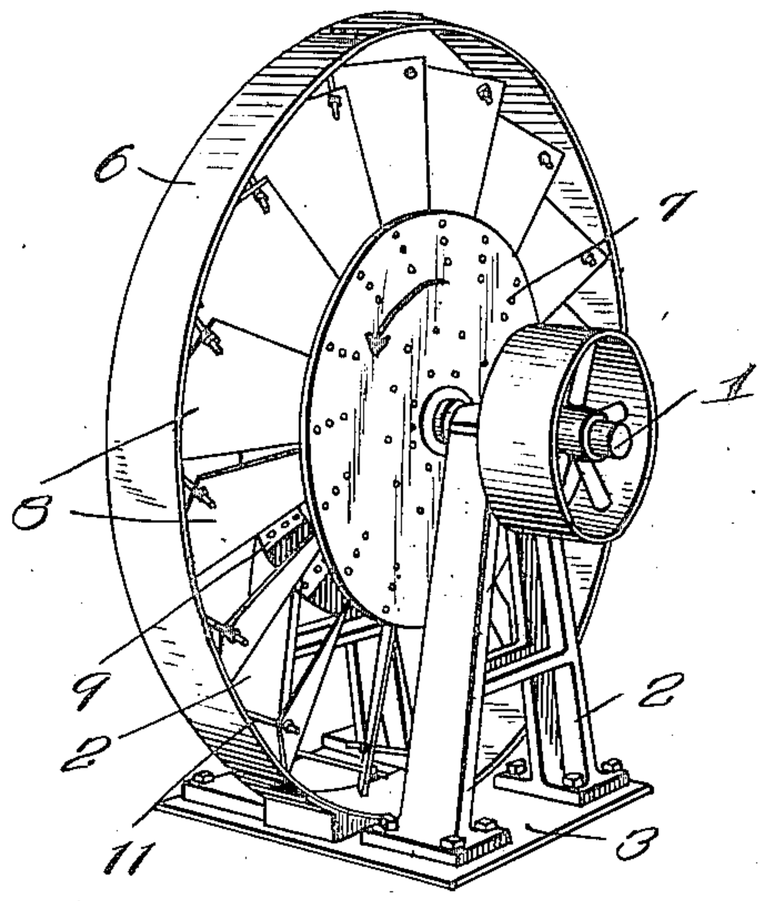


Fig. 3.

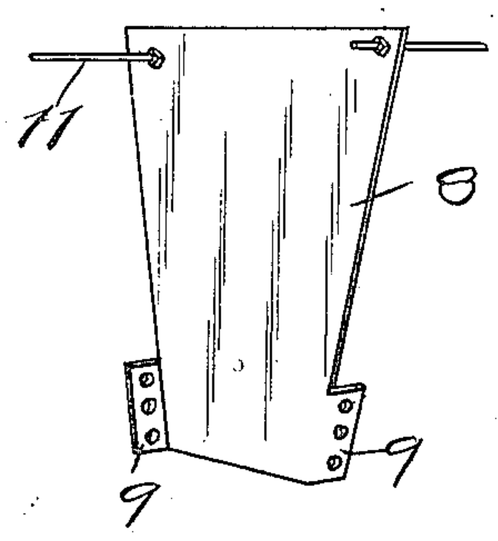
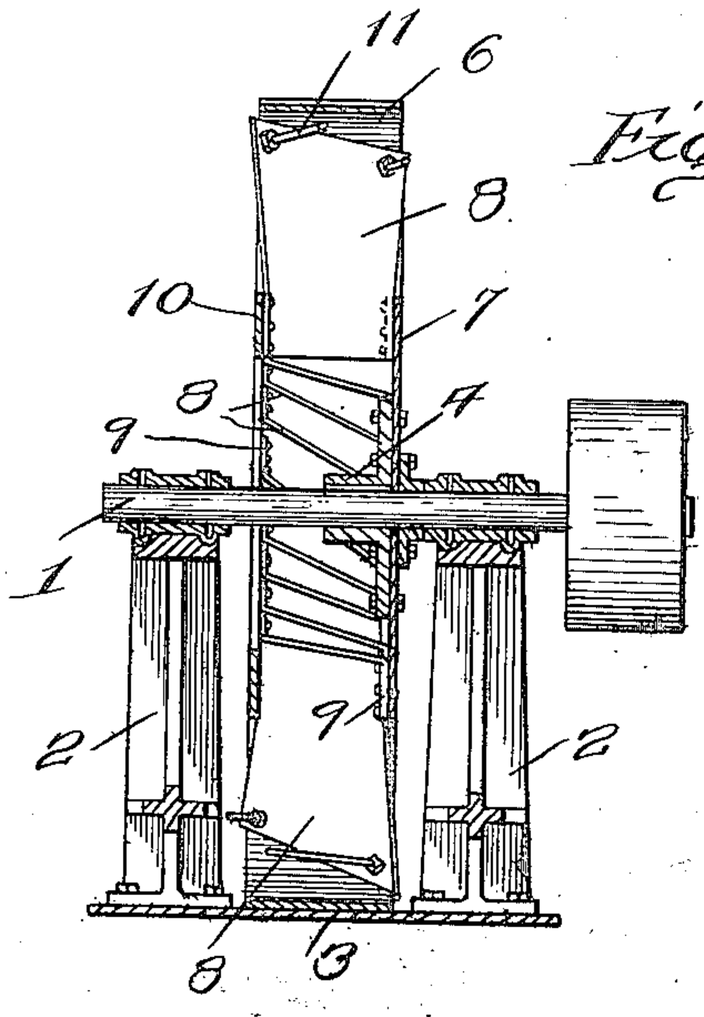


Fig. 4.



Witnesses

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UNITED STATES PATENT OFFICE.

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FAN-BLOWER.

1,136,827. Specification of Letters Patent. Patented Apr. 20, 1915.

Application filed June 19, 1909. Serial No. 503,207.

To all whom it may concern:

Be it known that I, WILLIAM J. MONTGOMERY, a citizen of of the United States, residing at Jeannette, in the county of Westmoreland and State of Pennsylvania, have invented certain new and useful Improvements in Fan-Blowers, of which the following is a specification, reference being had therein to the accompanying drawing.

This invention relates to fans and has as its object to provide a fan particularly adapted for the work of mine ventilation and is constructed so as to secure a maximum of efficiency combined with the qualities of mechanical simplicity and durability.

Figure 1 is a perspective view of a fan embodying my improvements. Fig. 2 is another perspective view showing the fan as seen from the side opposite that shown in Fig. 1. Fig. 3 is a view of one of the blades as it is shaped when in assembled position. Fig. 4 is a vertical section of the fan through the axis of the shaft.

The fan shaft 1 is mounted in bearings formed in the upper end of the standards 2, 2, which are bolted to the base plate 3. The driving hub 4 is keyed to the fan shaft and is formed with a radially extending flange 5 to which is bolted the disk 7 which fits snugly around the fan shaft.

The fan blades 8 are each formed from generally rectangular blanks provided at their inner ends with flanges 9, 9 extending in opposite directions in the plane of the fan at an angle of approximately 60° to the plane of the fan. The blades when fastened in place form acute angles with the plane of the fan. The flanges upon corresponding edges of the blades are riveted to the disk 7, and the flanges formed upon the opposite edges of the blades are riveted to the sheet metal ring 10, the greater diameter of which is the same as the diameter of the disk 7. The inner circumference of the ring approximately coincides with the circle of the inner edges of the blades, and the width of the ring is about equal to the length of one of the flanges 9. The ring is entirely unsupported except by the blades 8, and has no mechanical connection with the shaft 3 in any other manner. The blades extend outwardly from the peripheries of the disk 7 and ring 10 to a point within close proximity to the surrounding stationary circular casing 6, which is rigidly mounted upon the base plate 1 and is shown in the drawings as formed from a single steel band.

The rear outer corner of each blade is connected to the forward outer corner of the blade next behind it by means of an adjustable stay rod 11. By means of these stay rods the blades can be twisted until they assume a warped or spiral shape, and this distortion can be so magnified that the perpendicular distance between adjacent blades is approximately the same at any radial distance from the center of the fan.

The number of blades is so proportioned to the size of the fan and the angular relation of the plane of the blade to the plane of the fan is such that the radial edges of the blades overlap each other slightly and the stay rods 11 are disposed substantially perpendicular to the planes of the blades. This overlap is produced in part by the somewhat tapering shape of the blade from its inner and narrower to its outer and wider edge.

This fan is adapted to drive air from it along lines perpendicular to the plane of its circumference. In such fans difficulty has been heretofore experienced because of the reëntry of the air within the fan spaces at the center of the exit side of the fan. The disk 7, by means of which the blades are supported, effectually prevents any such back current of air.

The air is drawn toward the fan upon its inlet side at all points within the area of the fan circle, excepting, of course, the area occupied by the ring 10 and the shaft 1. Air is drawn into the air spaces between the ring 10 and the fan shaft, is then given a centrifugal motion by the suction action of the fan blades, and is lastly deflected along lines at right angles to the plane of the fan and discharged. By thus utilizing the central parts of the inlet side of the fan, the pressure of which the fan is capable is greatly augmented and the presence of the disk 7 is prevented from interfering with the capacity of the fan. Air is also received by the fan blades upon the inlet side at points between the ring 10 and the casing 6. Undesirable centrifugal action of the fan blades near their outer ends is prevented by causing the blades to assume the twisted spiral shape, already described, and it has been found by experiment that when

the blades are so constructed the air is driven forward from the fan at approximately the same velocity at all radial distances, in spite of the greatly varying linear velocity of the different portions of the blade, corresponding to the radial distance of such portions from the fan shaft.

The disk 7 should have at least one-fifth the diameter of the fan as a whole, and it has been found by experiment that when the diameter of this disk is about one-half, the efficiency of the fan is at a maximum.

What I claim is—

1. In a fan, the combination of the stationary support, the shaft mounted thereon, the solid plane disk rigidly secured to the shaft, the fan blades secured to the disk and disposed with their planes intersecting the plane of the disk and extending beyond the outer periphery of the disk, being adapted to throw air in a direction parallel to the fan shaft, and a circular plate of an outer diameter equal to that of the disk secured to the opposite edges of the fan blades in a position concentric with the fan shaft and having an in-take opening through which the blades can draw air.

2. In a fan, the combination of the stationary support, the shaft mounted thereon, the blades mounted upon the shaft so that each makes an acute angle with the plane of the fan as a whole and has its two radial edges disposed in straight lines, and stay-rods securing the rear outer corner of each blade to the forward outer corner of the blade behind it in such positions relatively to each other that the blades have the shape of a warped surface and that the perpendicular distance between adjacent straight radial edges of adjacent blades is substantially constant for all radial distances.

3. The combination of the shaft, the disk rigidly secured to the shaft, the blades secured to the disk independently of the shaft and projecting radially beyond it, and means independent of the shaft for connecting and bracing together rigidly the inner ends of the blades at their edges opposite to the disk and at points remote from the shaft.

4. The combination of the shaft, the disk rigidly secured to the shaft, the blades secured to the disk independently of the shaft and projecting radially beyond it, means independent of the shaft for connecting and bracing together rigidly the inner ends of the blades at their edges opposite to the disk and at points remote from the shaft, and devices carried by the blades for connecting them at their outer ends and holding them in fixed spaced relationship to each other.

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

WILLIAM J. MONTGOMERY.

Witnesses:

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E. A. HOLTON.