N. W. AKIMOFF.

CENTRIFUGAL FAN OR PUMP.

APPLICATION FILED FEB. 21, 1910.

1,165,931. Patented Dec. 28, 1915.

2 SHEETS—SHEET 1.

Fig. 2.

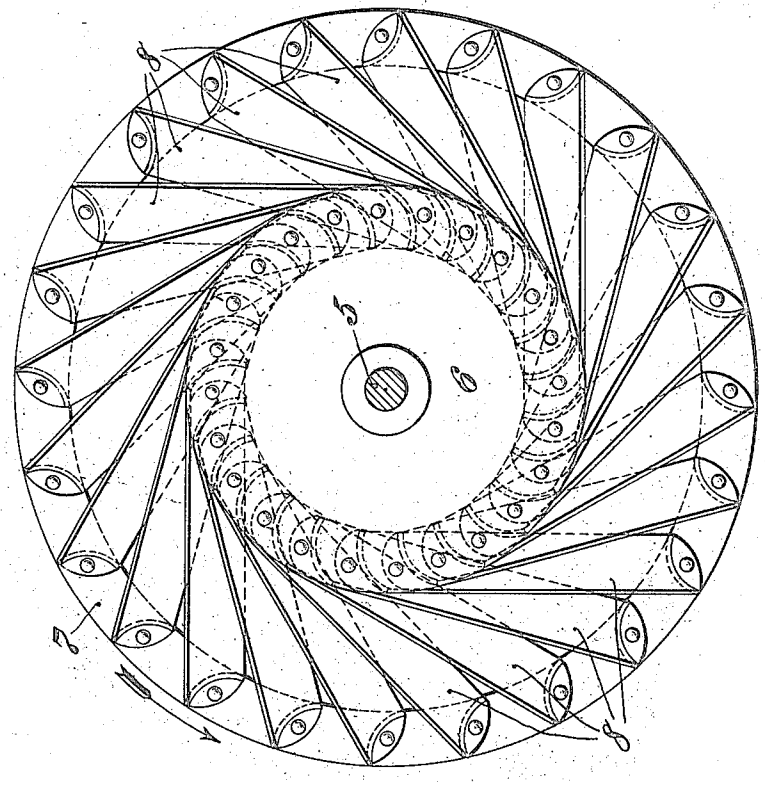
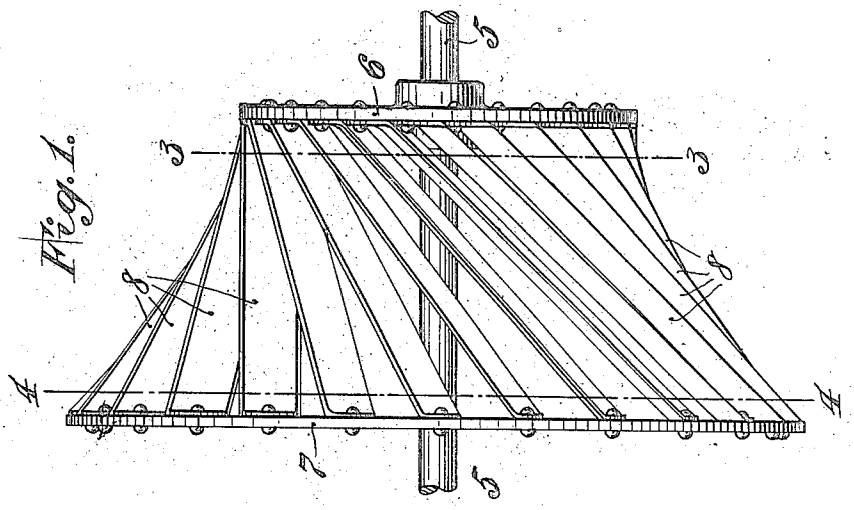


Fig. 1.



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2 SHEETS—SHEET 2.

Fig. 3.

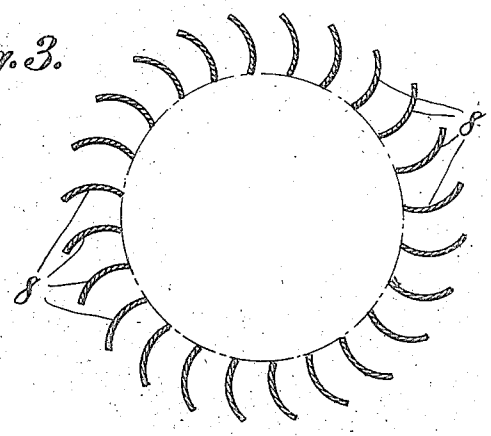
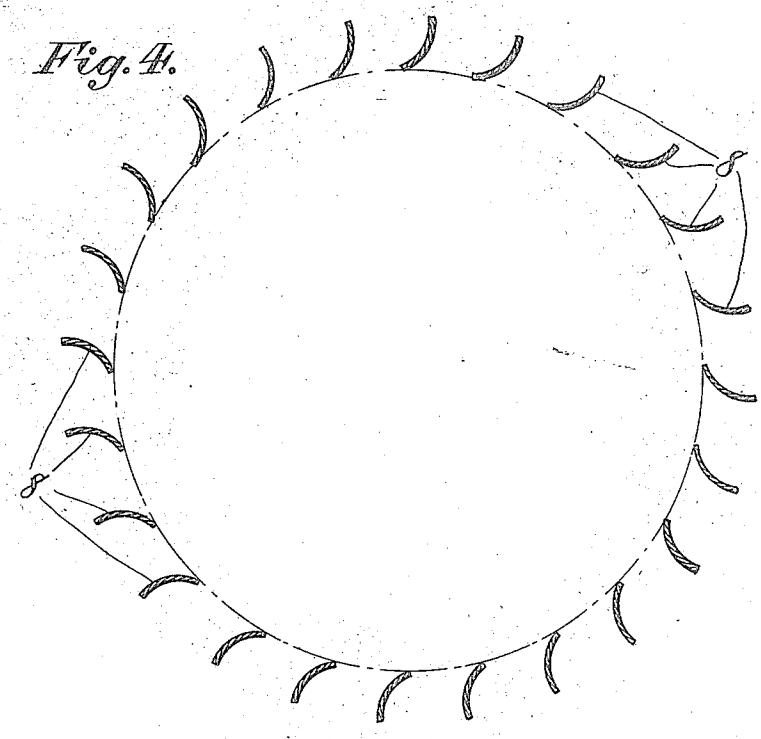


Fig. 4.



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UNITED STATES PATENT OFFICE.

NICHOLAS W. AKIMOFF, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, TO AMERICAN BLOWER COMPANY, OF GREEN ISLAND, NEW YORK, A CORPORATION OF NEW YORK.

CENTRIFUGAL FAN OR PUMP.

1,165,931. Specification of Letters Patent. Patented Dec. 28, 1915.

Application filed February 21, 1910. Serial No. 545,004.

To all whom it may concern:

Be it known that I, NICHOLAS W. AKIMOFF, a subject of the Czar of Russia, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Centrifugal Fans or Pumps, of which the following is a specification.

My invention relates to centrifugal fans or pumps and in such connection it relates more particularly to the construction and arrangement of the blades of the rotors of such devices.

The object of my invention is to provide a rotating element for fans and pumps of the centrifugal type in which the utmost efficiency will be obtained, consistent with simplicity of construction.

Heretofore two important types of fans or blowers with concaved blades have been developed in one of which the longitudinal extension of the blades is parallel to the shaft or axis of rotation of the rotor element, resulting in a "squirrel cage" arrangement of cylindrical conformation. In the other type referred to the general longitudinal extension of the blades is parallel to planes radiating from the axis of rotation but the blades in this instance were inclined throughout their length, resulting in an arrangement of frustoconical conformation. In these two main types certain deficiencies occur which are readily understood. In the cylindrical form it is evident that the blades will not act uniformly throughout their length on the impelled fluid on account of the differences in direction of said fluid as it is presented to the blades and is taken up and impelled thereby. This deficiency is well known to those skilled in the art. In the other or conical type of rotor the defect consists in the fact that the blades will present the same angle of incidence to the radius throughout their entire length which results in a loss of efficiency, as it is well known that to secure the greatest efficiency, the angle of incidence must vary as the radius changes. Of course it will be understood that if the blades were twisted or otherwise of complex shape the aforesaid defects might be overcome but this would result in a needless complexity of the structure.

In the device of my present invention I seek to overcome the defects as before stated by constructing a rotor with non-twisted concaved blades of substantially uniform cross section throughout their length, but which are arranged at an angle both to the axis of rotation of the rotor and to the planes radiating from said axis. This construction results in a rotor having a surface developed by the rotating blades which is neither cylindrical nor conical but on the other hand is a one napped hyperboloid of revolution which it is believed is a configuration which will present the best condition for the impelled fluid as the same enters the interstices between the blades.

The nature and characteristic features of my invention will be more readily understood from the following description taken in connection with the accompanying drawings forming part hereof, in which—

Figure 1 is a side elevation of a rotor of a centrifugal fan or pump embodying the main features of my present invention; Fig. 2 is an end elevation thereof; Fig. 3 is a plane section taken on the line 3—3 of Fig. 1 and Fig. 4 is a plane section taken on the line 4—4 of Fig. 1.

Referring to the drawings, 5 is the shaft on which the rotor is mounted; 6 is a disk which forms a closure at one end of said rotor, and 7 is a ring at the other or intake end of the rotor.

8 are the impelling blades of curvilinear cross section, as clearly shown in Figs. 2 to 4. The blades are preferably of a uniform cross section and untwisted throughout their length and are secured at one end to the disk 6 and at the other end to the ring 7. The blades extend from disk 6 to ring 7 in a direction at an angle to the axis of the shaft 5 as well as at an angle to the planes radiating from said axis as clearly shown in Fig. 1 of the drawings. By the construction as aforesaid the inner and outer edges of the blades 8 will each develop in their rotation a surface which will be a true hyperboloid of revolution due to the well known mathematical property of the development of such a surface by the rotation of a straight line about an axis with which said line is not parallel and which it does not intersect. This arrangement results in several advantages, it being evident that the impelled fluid must enter the cen-

tral chamber inclosed by the blades 8 in an initial direction parallel to the axis of rotation and that as the direction of the fluid is changed as the same is taken up by the blades the proper angle of the edges said blades considered longitudinally will be presented to the impelled fluid at all points along the length of said blades. Furthermore as clearly shown in Figs. 3 and 4 of the drawings, the angle of incidence of the inner part of each of the blades with respect to the radius will be varied throughout the length of the blades and thereby will be secured a greater degree of efficiency than would otherwise be the case, this result being obtained without complexity of the shape of the individual blades.

While the device as shown only encompasses a small frustum of a hyperboloid of revolution on one side of the transverse axis only of the hyperbola from which the hyperboloid of revolution is generated, it will of course be understood that any desired frustum of the hyperboloid may be obtained by variations in the length of blades as well as through variations in the angle of the generatrix formed by the edges of said blades.

Having thus described the nature and characteristic features of my invention what I claim as new and desire to secure by Letters Patent is:—

1. A rotor for a centrifugal fan or pump comprising a series of elongated blades arranged in form of a conoidal drum to form a central intake chamber, and adapted to draw in the fluid axially and discharge it circumferentially, and having a disk at the smaller end of the drum, such blades having their disk ends inclined in the direction of rotation to a greater extent than their intake ends.

2. A rotor for centrifugal fans or pumps comprising a series of elongated blades arranged in drum form to form a central intake chamber, and adapted to draw in the fluid axially and discharge it circumferentially, and each of said blades being arranged with its longitudinal extension inclined to all planes radiating from the axis of rotation and having its disk end inclined in the direction of rotation to a greater extent than its intake end.

3. A rotor for centrifugal fans or pumps comprising a disk forming a closure at one end, a ring at the other or intake end, and a series of elongated blades concaved in transverse section and each extending from said disk to said ring in a direction inclined to all planes radiating from the axis of rotation, and the disk ends of said blades being inclined in the direction of rotation to a greater extent than their intake ends.

4. A rotor for centrifugal fans or pumps comprising a disk forming a closure at one end, a ring at the other or intake end, and a series of elongated blades concaved in transverse section and each extending from said disk to said ring in a direction inclined to all planes radiating from the axis of rotation, said blades being of substantially uniform cross-section and untwisted throughout their length whereby the disk ends of said blades will be inclined in the direction of rotation to a greater extent than their intake ends.

5. A rotor for centrifugal fans or pumps comprising a series of elongated blades arranged in drum form to form a central chamber, and adapted to draw in the fluid axially and discharge it circumferentially, such blades having their disk ends inclined in the direction of rotation to a greater extent than their intake ends and having straight inner and outer marginal edges extending in a direction inclined to all planes radiating from the axis of rotation to thereby lie in surfaces which are hyperboloids of revolution.

6. A rotor for a centrifugal fan or pump comprising a series of elongated blades arranged in form of a conoidal drum to form a central intake chamber, and adapted to draw in the fluid axially and discharge it circumferentially, the blades being curved with their concave faces in advance, and the blades inclined to planes coinciding with the axis of rotation, whereby one end of each blade is in advance of the other.

7. A rotor for a centrifugal fan or pump comprising a series of elongated blades arranged in form of a conoidal drum to form a central intake chamber, and adapted to draw in the fluid axially and discharge it circumferentially, the blades being curved with their concave faces in advance, and the blades inclined to planes coinciding with the axis of rotation, with the blades at the larger end of the drum in advance of those at the smaller end.

8. A rotor for a centrifugal fan or pump comprising a series of elongated curved blades arranged in form of a conoidal drum to form a central intake chamber, and adapted to draw in the fluid axially and discharge it circumferentially, the blades being inclined to planes coinciding with the axis of rotation, and being arranged in transverse section with respect to radii from the axis of rotation, so that each blade presents from the smaller to the larger end of the drum a continually changing angle to a radius intersecting it.

9. A rotor for a centrifugal fan or pump comprising a series of elongated blades arranged in form of a conoidal drum to form a central intake chamber, and adapted to draw in the fluid axially and discharge it circumferentially, the blades being inclined to planes coinciding with the axis of rotation,

and being arranged in transverse section with respect to radii from the axis of rotation, so that each blade has its tip portion at the smaller end of the drum inclined forwardly of a radius intersecting it and inclined thence backwardly toward the larger end of the drum.

10. A rotor for a centrifugal fan or pump comprising a series of elongated blades arranged in form of a conoidal drum to form a central intake chamber, and adapted to draw in the fluid axially and discharge it circumferentially, the blades being inclined to planes coinciding with the axis of rotation, and in transverse section shaped to afford the more effective centrifugal action at the smaller end of the drum and the less effective centrifugal action at the larger end of the drum.

In testimony whereof I have hereunto signed my name in the presence of two witnesses.

NICHOLAS W. AKIMOFF.

Witnesses:

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WILLIAM S. ATCHISON.