

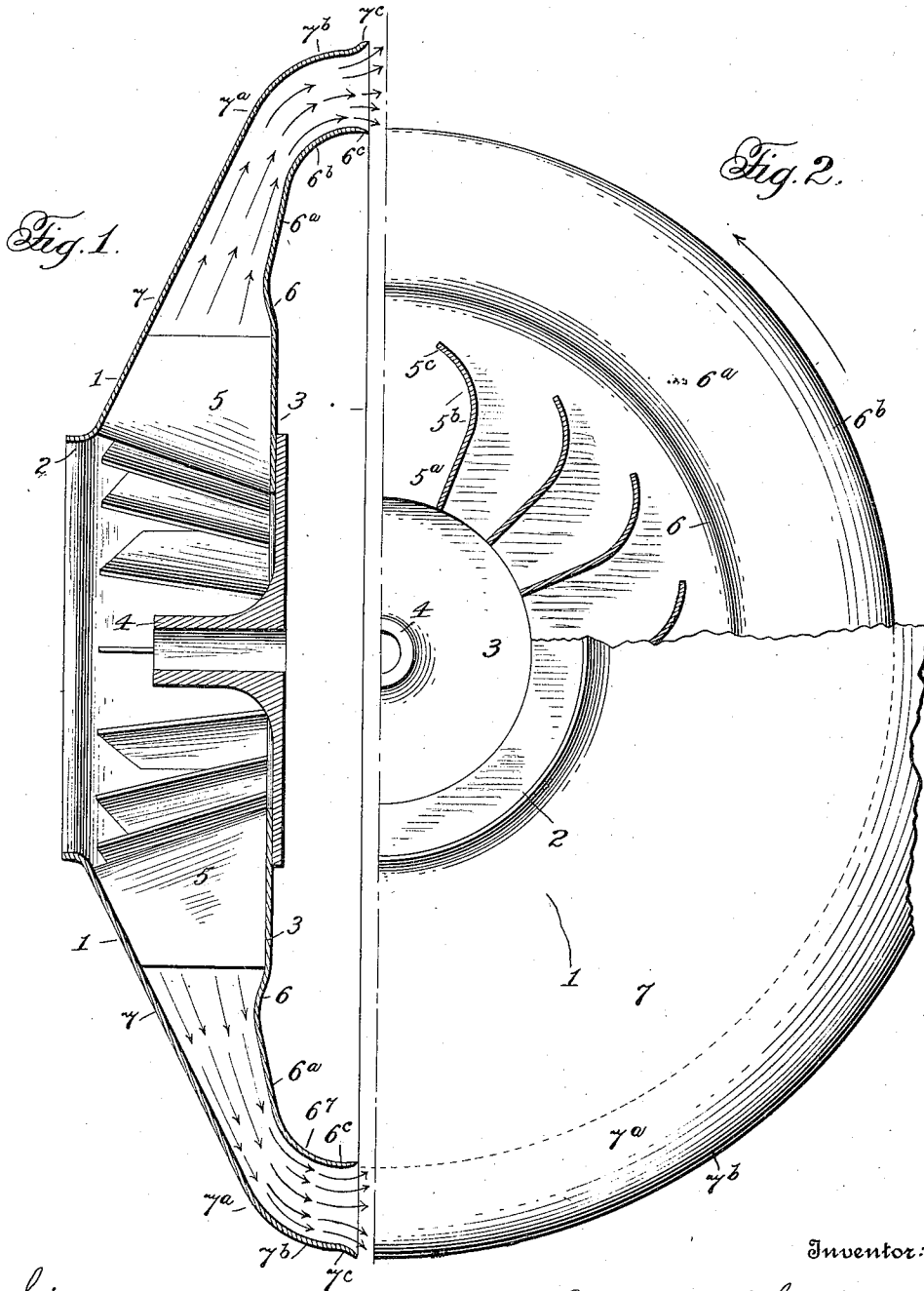
Mar. 6, 1923.

1,447,916

J. A. WATKINS
CENTRIFUGAL FAN

Filed Dec. 18, 1920

2 sheets-sheet 1



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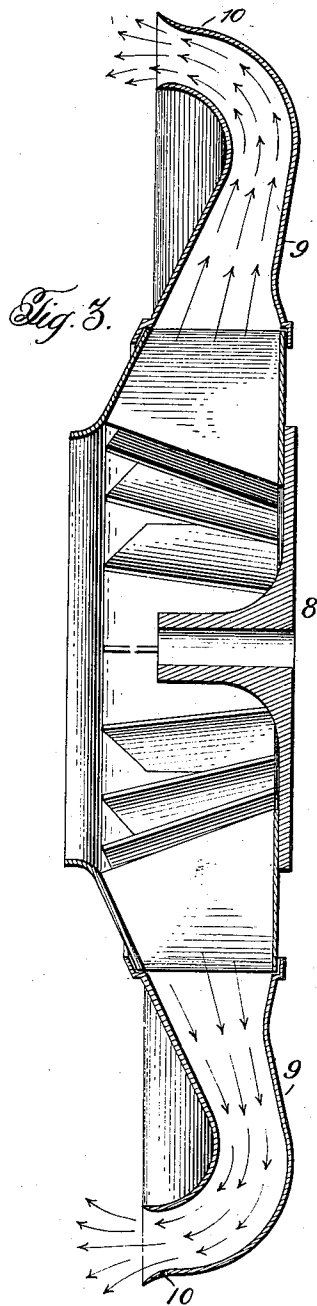


Fig. 3.

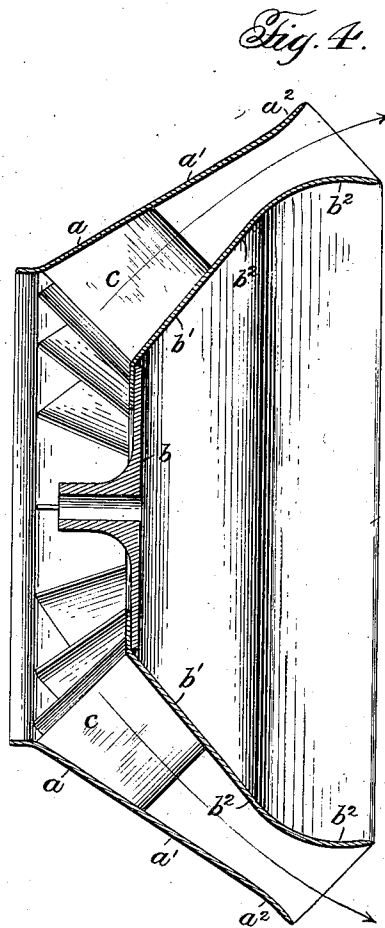


Fig. 4.

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UNITED STATES PATENT OFFICE.

JAMES A. WATKINS, OF DETROIT, MICHIGAN, ASSIGNOR TO AMERICAN BLOWER COMPANY, OF DETROIT, MICHIGAN, A CORPORATION OF MICHIGAN.

CENTRIFUGAL FAN.

Application filed December 18, 1920. Serial No. 431,591.

To all whom it may concern:

Be it known that I, JAMES A. WATKINS, a citizen of the United States, residing at Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Centrifugal Fans, of which the following is a specification, reference being had therein to the accompanying drawing.

This invention relates to improvements in centrifugal fans of the type having an annular peripheral discharge nozzle described in my prior application for centrifugal fan, filed Oct. 6, 1920, Serial No. 414,987.

An important novel characteristic of the present invention resides in the provision of a centrifugal fan with an annular peripheral discharge nozzle constructed and arranged to discharge laterally or axially of the wheel.

The invention, with other objects and advantages thereof, and the particular construction, combination and arrangement of parts comprising the same, will be understood from the hereinafter detailed description, when considered in connection with the accompanying drawings forming part hereof and illustrating embodiments of the invention.

In the drawings:—

Figure 1 is a vertical section of a centrifugal fan constructed in accordance with the present invention.

Figure 2 is a side elevation with a part of one end plate broken away.

Figure 3 is a vertical section of a modified construction.

Figure 4 is a vertical section illustrating another modification.

Referring to Figs. 1 and 2 of the drawings, the invention is here shown applied to a fan wheel structure comprising a front coned ring 1 having the opening 2 forming the eye of the fan, a back disk and hub 3, 4, and blades 5, the latter each consisting of an inner radially extending part 5^a, an intermediate part 5^b curved in approximately the segment of a cylinder, and an outer portion 5^c extending in a direction diverging from the plane of the inner radial part 5^a.

The invention comprehends a peripheral nozzle for the fan wheel comprising spaced annular walls forming a continuation of the shrouding or the end plates of the wheel that will afford an open discharge all around

the wheel and give the air sufficient directive velocity so that less disturbance is caused at the exit of the blades and providing for a forward or backward discharge axially of the wheel.

In the particular construction illustrated, by way of example, Figs. 1 and 2, the discharge nozzle is shown combined with the fan wheel as a single part to rotate therewith, the nozzle being formed by annular extensions of the front coned ring 1 and back plate 3. The annular extension of the back plate 3 has an inner conical portion 6 extending at an inward inclination, a conical portion 6^a extending at an outward inclination at an angle about equal to the angle of inclination of the part 6, and an outer laterally curved part 6^b. The extension of the front coned ring 1 consists of an inner conical part 7 shown extending inwardly at the same angle as that of the conical ring 1, and an outer laterally curved part 7^a. The inner opposing portions 6, 6^a, and 7 of the extensions of the back plate 3 and coned ring 1 form an inner nozzle part having inwardly converging walls, the outer curved portions 6^b and 7^b having outer outwardly diverging lips or end portions 6^c, 7^c, said curved portions 6^b and 7^b, intermediate the end portions 6^c, 7^c, and the inner wall portions 6 and 7, being spaced from each other a substantially equal distance throughout, providing an outer axially extending circumferentially backward discharge. The inner part of the nozzle formed by the opposing wall portions 6, 6^a and 7 of the extensions is shaped to conform to the path of the air as it would leave the wheel under open discharge conditions, this inner part of the nozzle simply acting to continue the convergence of the air to such a point as to give it sufficient directive velocity. From this point the air passing through the outer outlet part of the nozzle is directed laterally and discharged substantially parallel with the axis of the wheel.

The modified construction illustrated in Fig. 3 of the drawings is substantially the same as that shown in Figs. 1 and 2 except that the nozzle is formed as a separate part from the wheel and has a forward instead of a backward discharge. In this figure, 8 designates the fan wheel, 9 the inner part of the nozzle having inwardly converging wall portions, and 10 the outer curved wall

portions forming the outer forwardly extending discharge.

The modified construction illustrated in Fig. 4 of the drawings includes a fan wheel comprising a front coned ring *a*, a back plate or member having a central part *b* extending at right angles to the axis of the wheel, and an adjoining outer coned portion *b'*, and *c* designates the blades, the latter, in this instance, being disposed at a substantial inclination to the axis of the wheel. The nozzle is composed of annular extensions of the end plate portions *a*, *b'* of the wheel, said extensions having opposing inwardly converging inner portions *a'*, *b''*, and outer portions *a''*, *b''*, the latter being curved as shown and arranged relative to the wall portion *a''* to provide therewith a discharge substantially axially of the wheel.

The constructions hereinbefore described provide an open discharge all around the wheel, the diffusion taking place a considerable distance from the wheel structure so that less disturbance is caused at the exit of the blades, resulting in a material increase in efficiency, while at the same time provision is made for either a forward or backward discharge, and the scroll volute housing commonly employed with centrifugal fans being entirely dispensed with.

I desire it to be understood that the invention, in its broader aspect, is not to be limited to any special construction of fan wheel; that the same is applicable to the various types of fan wheels, and that variations and changes in the particular nozzle structure illustrated in the drawings, and the embodiment of the invention in other forms as will appeal to those skilled in the art and falling within the scope of the appended claims, may be made without departing from the principles of the invention.

What I claim is:—

1. A centrifugal fan consisting of an enclosed fan wheel provided with an annular peripheral discharge nozzle extending beyond the delivery end portions of the fan blades and rotatable with the fan wheel, said nozzle being constructed and arranged to discharge the air laterally of the wheel.

2. A centrifugal fan consisting of an enclosed fan wheel provided with an annular peripheral discharge nozzle extending beyond the delivery end portions of the blades and rotatable with the fan wheel, said nozzle being constructed and arranged to discharge the air circumferentially and substantially parallel to the axis of rotation of the fan wheel.

3. A centrifugal fan consisting of an enclosed fan wheel provided with an annular peripheral discharge nozzle extending beyond the delivery end portions of the blades and rotatable with the fan wheel, said discharge nozzle being constructed and ar-

ranged to discharge the air laterally of the wheel, the nozzle having annular inwardly converging wall portions.

4. A centrifugal fan including a fan wheel, and an annular peripheral discharge nozzle therefor, the nozzle being constructed and arranged to discharge the air laterally of the wheel, said nozzle having annular inwardly converging wall portions and outwardly diverging wall portions at the outer end thereof.

5. A centrifugal fan consisting of an unenclosed fan wheel, provided with an open annular peripheral discharge nozzle extending beyond the delivery end portions of the blades and rotatable with the fan wheel, said nozzle having an inner part provided with annular inwardly converging walls, and an outer laterally extending outlet part.

6. A centrifugal fan consisting of a fan wheel, and an annular peripheral discharge nozzle therefor rotatable therewith, the nozzle having a part extending substantially radially of the wheel and provided with inwardly converging walls, and said nozzle having a laterally extending outlet part.

7. A centrifugal fan including a fan wheel, and an annular peripheral discharge nozzle therefor, the nozzle having a part extending substantially radially of the wheel and provided with inwardly converging walls, and said nozzle having an outer outlet part extending substantially parallel with the axis of rotation of the fan wheel and provided with outwardly diverging wall portions at the outer end thereof.

8. A centrifugal fan consisting of a fan wheel comprising a flat back-disk section disposed at right angles to the axis of the wheel, a front coned ring, blades between the disk and ring, said back-disk section and coned ring being provided with annular peripheral extensions rotatable therewith and forming an annular discharge nozzle having a laterally extending outlet part.

9. A centrifugal fan consisting of a fan wheel comprising a flat back-disk section disposed at right angles to the wheel, a front coned ring, blades between the disk and ring, said back-disk section and coned ring being provided with annular peripheral extensions rotatable therewith and forming an annular discharge nozzle, the nozzle having an inner part provided with inwardly converging walls, and an adjoining laterally extending outlet part.

10. A centrifugal fan consisting of a fan wheel, and an annular peripheral discharge nozzle therefor rotatable therewith, the nozzle having a part extending substantially radially of the wheel and having inwardly converging walls, and an adjoining curved laterally extending outlet part.

11. A centrifugal fan consisting of a fan wheel comprising a flat back-disk section

disposed at right angles to the axis of the wheel, a front coned ring, blades between the disk and ring, the back-disk section and coned ring having annular peripheral extensions rotatable therewith and forming an annular discharge nozzle, the back disk extension having an inner annular portion extending at an inward inclination, and the coned ring extension having an inner portion extending inwardly at the angle of the

coned ring, and said extensions having outer laterally curved portions providing a laterally extending outlet.

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

JAMES A. WATKINS.

Witnesses:

FREDERICK R. STILL,
EDWIN BREDE.