Feb. 19, 1924. 1,484,597

J. A. WATKINS

CENTRIFUGAL FAN

Filed Dec. 18, 1920 2 Sheets-Sheet 1

Fig. 1.

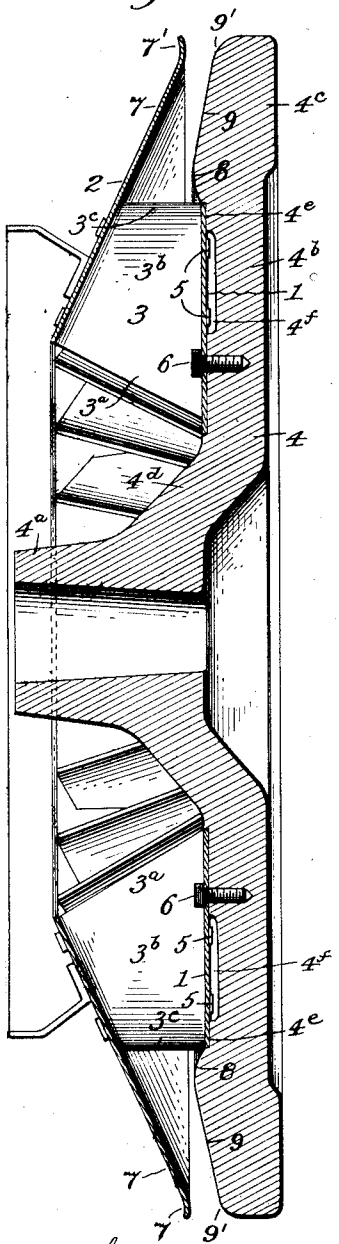
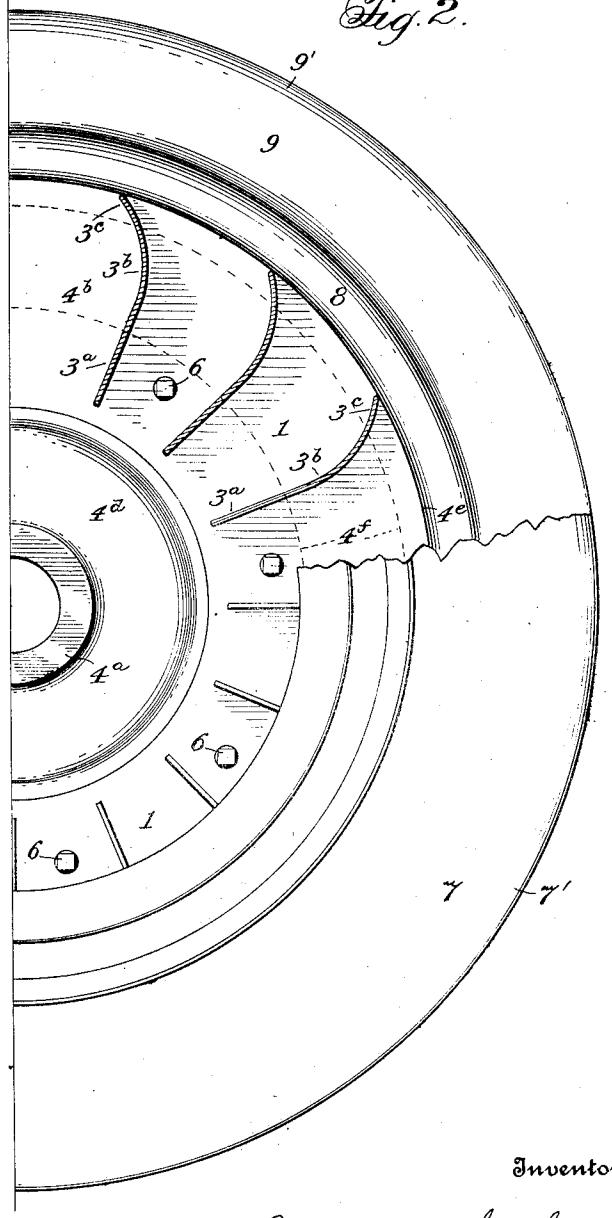


Fig. 2.



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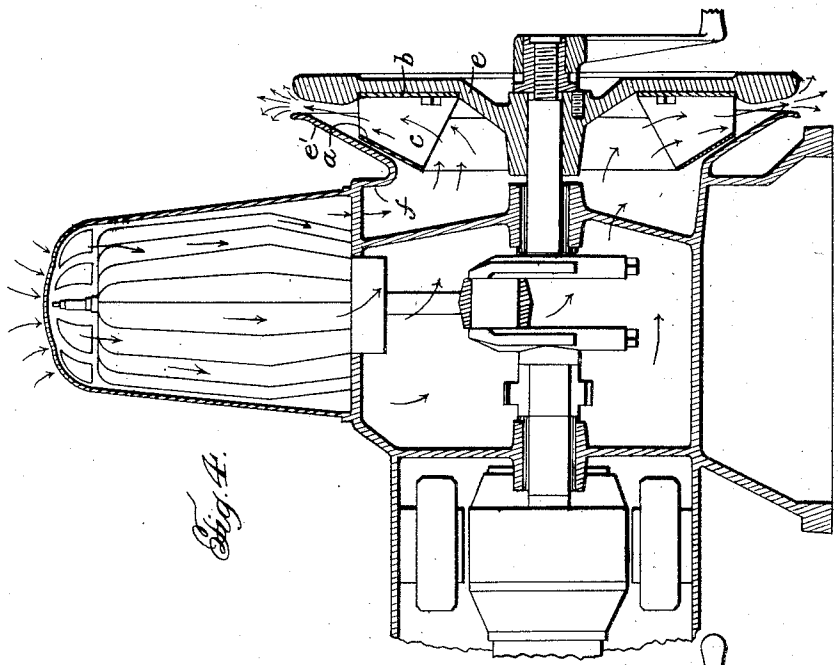


Fig. 4.

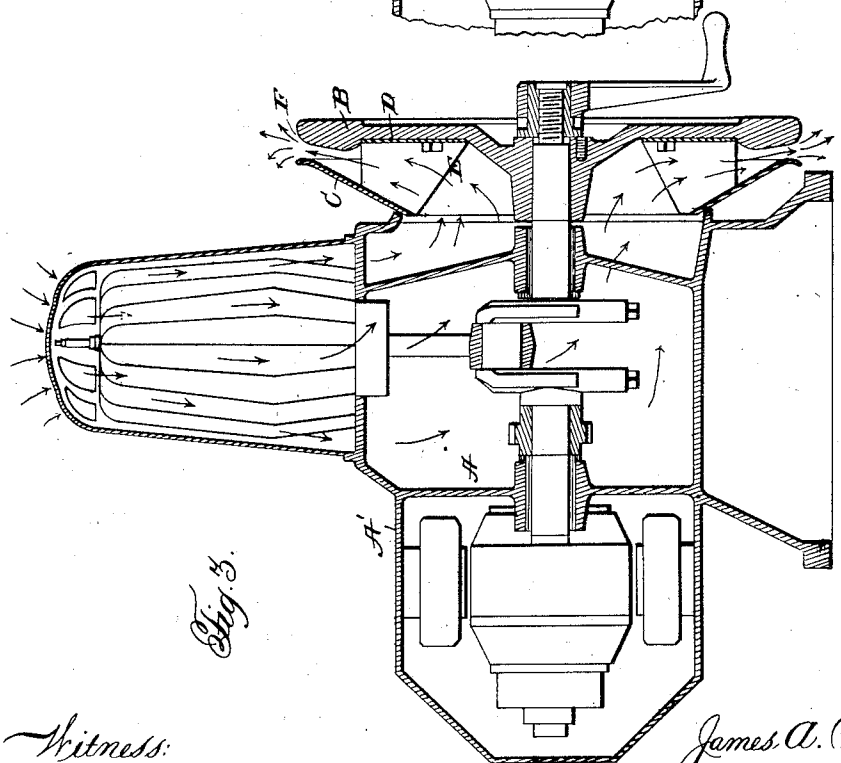


Fig. 5.

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Patented Feb. 19, 1924. 1,484,597

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. 431,590.

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, and more especially to the improved type of fan described in my application filed October 6, 1920, Serial No. 414,987, in which the fan is provided with an improved annular peripheral discharge nozzle, and the usual scroll volute housing is dispensed with.

The object of the present invention is to simplify and reduce the cost of construction, and to provide an improved construction of the kind referred to, particularly adapted for use in those instances in which a fan is employed with an engine or in a machine having a fly wheel.

Important novel characteristics of the invention reside in the special construction in which one of the machine or engine parts forms part of the annular peripheral discharge nozzle of the centrifugal fan, and particularly in the special construction and association of parts in which a fly wheel is utilized to constitute part of the back plate of the fan wheel and part of the peripheral discharge nozzle, the resulting structure possessing material advantages from the standpoint of simplicity and economy in production.

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 contained 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 central section of a centrifugal fan constructed in accordance with the present invention.

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

Figure 3 is a side elevation illustrating the use of the improved fan in connection with one of the standard types of internal combustion engine equipment.

Figure 4 is a part section and side elevation illustrating a modified construction in which the annular discharge nozzle is formed partly by the fly wheel and a part of the engine casing.

Referring particularly to Figs. 1 and 2 of the drawings, the particular construction shown comprises a flat wheel disk or back ring member 1, a front coned disk 2, and blades 3 located between and suitably secured to the back disk 1 and front coned disk 2. In this instance, the blade structure shown consists of an inner radially extending part 3^a, an intermediate part 3^b curved in approximately a segment of a cylinder, and an outer portion 3^c extending in a direction diverging from the plane of the inner radial portion 3^a, the blades being disposed as illustrated, with reference to the direction of rotation of the fan wheel indicated by the arrow.

4 designates a fly wheel having a hub part 4^a, a web 4^b, and an outer part 4^c. The structure including the back ring 1, front disk 2 and blades 3, is positioned alongside the fly wheel 4 with the back disk or ring member 1 fitting thereagainst and firmly secured thereto, the hub part 4^a and adjacent portion of the fly wheel structure constituting the hub and part of the back end wall or plate of the fan wheel. The fly wheel is shown provided at one side with a conoidal surface 4^d, at its hub part, and with an annular depression or recess 4^e, the back disk or ring 1 being seated in the recess 4^e with its outer face flush with the adjoining portion of the conoidal surface 4^d, the latter forming a continuation of the back ring and completing the back wall or end plate portion of the fan wheel. 4^f designates an annular recess to accommodate the projecting portions 5 of the blade connections. Any suitable means may be employed to secure the back ring 1 to the fly wheel 4, that shown in the drawing consisting of screws 6.

The annular peripheral discharge nozzle for the fan is formed by a peripheral extension 7 of the front coned disk 2 and the outer peripheral part 4^c of the fly wheel, said parts constituting in effect substantial continuations of the end walls or shrouding of the wheel, and having converging wall

portions and outer diverging portions. The annular extension 7 of the front coned disk 2 is shown extending at the same angle as the angle of the conical face of the disk and provided with an outer outwardly flaring lip 7'. The opposing side face of the outer peripheral portion 4^c of the fly wheel has an inwardly curved portion 8 extending from the outer marginal edge of the back disk 1 and flush with the outer face thereof, from thence a portion 9 extending substantially in an inclined plane, and an outer outwardly curved lip portion 9'.

The annular peripheral discharge nozzle formed by the extension 7 and outer peripheral portion 4^c of the fly wheel is shaped to conform to the path of the air as it would leave the wheel under open discharge conditions. No material change in the direction of the air is effected, the nozzle simply acting to continue the convergence of the air to such a point as to give it sufficient directive velocity, and at this point providing an efficient discharge. In this way, the diffusion takes place a considerable distance from the wheel, less disturbance being caused at the exit of the blades, resulting in increased efficiency.

In Fig. 3 of the drawings, the improved construction is illustrated in connection with one of the standard types of internal combustion engines, the latter being of well known construction and only indicated diagrammatically. A designates the engine and A' the engine casing. B designates the fly wheel structure, C the back ring, D the front ring, E the blades, and F the annular peripheral discharge nozzle. In the modified construction illustrated in Fig. 4 a portion on the engine casing forms part of the annular discharge nozzle. In this view *a* designates the back ring, *b* the front ring, *c* the blades and *e* the fly wheel structure. This modified construction is the same as that illustrated in Figs. 1 and 2 except that the front ring 1 is not provided with a peripheral extension beyond the blades *c*, one side of the annular nozzle being formed by the portion *e'* on the engine casing *f*.

The special construction and arrangement of parts hereinbefore described, as will be appreciated, results in considerable saving of material and the cost of production, the structure provided being of a simple, compact and efficient nature.

While in the drawings is illustrated a specific embodiment of the invention, it will, of course, be understood that changes and variations in the particular constructions shown may be made; instead of the particular type of fan wheel and blade illustrated, the invention may be practiced with the various other types of fan wheels, and embodied in other forms as will appeal to those skilled in the art and falling within the scope of the appended claims, without departing from the spirit of the invention.

What I claim is:

1. The combination with an engine, of a centrifugal fan comprising a fan wheel, and an annular peripheral discharge nozzle therefor, a part of the engine being constructed and arranged to constitute part of said discharge nozzle.

2. The combination with an engine, of a centrifugal fan comprising a fan wheel, and an annular peripheral discharge nozzle therefor, said discharge nozzle having opposing annular converging walls, the engine having a part thereof constructed and arranged to form part of said discharge nozzle.

3. The combination with an engine, of a centrifugal fan comprising a fan wheel, and an annular peripheral discharge nozzle therefor, said nozzle having opposing annular inwardly converging walls, and adjoining outwardly diverging wall portions, a part of the engine being constructed and arranged to constitute part of said discharge nozzle.

4. The combination with a fly wheel structure, of a centrifugal fan comprising a fan wheel, and an annular peripheral discharge nozzle therefor, said fly wheel being constructed and arranged to constitute part of said discharge nozzle.

5. The combination with a fly wheel structure, of a centrifugal fan comprising a fan wheel and an annular peripheral discharge nozzle therefor, said nozzle having opposing annular converging walls, and adjoining outwardly diverging walls, the fly wheel being constructed and arranged to form one of the opposing walls of said discharge nozzle.

6. A centrifugal fan including a fly wheel, a fan wheel positioned at one side of the fly wheel, said fly wheel having an outer annular peripheral portion extending beyond the tips of the blades of the fan wheel, and an end plate of the fan wheel having an annular peripheral extension, said outer peripheral portion of the fly wheel and the annular peripheral extension of the end plate of the fan wheel being constructed and arranged to form an annular peripheral discharge nozzle for the fan wheel.

7. A centrifugal fan including a fly wheel, a fan wheel positioned at one side of the fly wheel, said fly wheel having an outer annular peripheral portion extending beyond the tips of the blades of the fan wheel, and an end plate of the fan wheel having an annular peripheral extension, said outer peripheral portion of the fly wheel and the annular peripheral extension of the end plate of the fan wheel being constructed and arranged to form an annular peripheral discharge nozzle for the fan wheel having opposing converging walls.

8. A centrifugal fan including a fly wheel,

a fan wheel positioned at one side of and secured to the fly wheel, the fly wheel having an outer peripheral portion extending beyond the tips of the blades of the fan wheel, and an end plate of the fan wheel having an annular peripheral extension, the outer peripheral portion of the fly wheel and the annular peripheral extension of the end blade of the fan being constructed and arranged to form an annular peripheral discharge nozzle for the fan wheel.

9. A centrifugal fan including a fly wheel, a fan wheel positioned at one side of the fly wheel, and comprising spaced end plates and blades secured therebetween, the fly wheel having an inner flat face portion at one side thereof, one end plate of the fan fitting against said flat face portion, means for securing said end plate of the fan to the fly wheel, the fly wheel having an outer peripheral portion extending beyond the tips of the blades of the fan wheel, and the outer end plate of the fan wheel having a peripheral extension, said outer annular portion of the fly wheel and the annular extension of the outer end plate of the fan being constructed and arranged to form an annular peripheral discharge nozzle for the fan wheel.

10. A centrifugal fan including a fly wheel, a fan wheel comprising a flat back disk section disposed at right angles to the axis of the fan, a front coned disk ring, blades between the disk section and coned ring, the fly wheel having at one side an inner flat face portion, said fan wheel being arranged adjacent the fly wheel with its flat back disk section fitting against the inner flat face portion of the fly wheel, means securing the back disk section to the fly wheel, said fly wheel having an outer annular peripheral part extending beyond the tips of the blades of the fan wheel, the face of the outer peripheral portion of the fly wheel at one side from the tips of the blades of the fan wheel curving inwardly and thence extending at an outward inclination, and said outer coned ring section having a peripheral extension disposed opposite said outer peripheral portion of the fly wheel and forming therewith an annular peripheral discharge nozzle.

11. A centrifugal fan including a fly wheel, a fan wheel structure comprising a flat annular back ring section, a front disk, blades between the back ring section and the front disk, said fan wheel structure being arranged adjacent the fly wheel with its flat back ring section fitting against the inner flat face portion of the fly wheel, and secured thereto, the fly wheel constituting part of the inner back end wall of the fan wheel.

12. A centrifugal fan including a fly wheel provided with an annular recess in one side face thereof, a fan wheel comprising a flat annular back disk, a front disk ring, blades between the back disk and front ring, said fan wheel being arranged at one side of the fly wheel with the annular back disk secured to and seated in the annular recess of the fly wheel with a portion of the side face of the fly wheel extending flush with the outer face of said back ring and forming a continuation thereof and part of the back wall of the fan wheel.

13. A centrifugal fan including a fly wheel, a fan wheel structure positioned at one side of the fly wheel and comprising a front plate, a back ring member, and blades located between said front plate and back ring member, and secured thereto, and means for securing the back ring member to the fly wheel, said back ring member being of less area than the area of the adjoining side face of the fly wheel and fitting against a portion thereof, the fly wheel forming part of the inner back end wall of the fan wheel and constituting a support therefor.

14. A centrifugal fan including a fly wheel having a laterally extending hub part, and provided at one side with an inner conoidal face adjoining said hub part, and with an annular depression outwardly of said conoidal face, and a fan wheel comprising a flat annular back ring member, and a front plate, said fan wheel being arranged at one side of the fly wheel with the annular back ring member seated within the annular depression in the fly wheel, and secured thereto with the adjoining portion of the inner conoidal face of the fly wheel extending substantially flush with the outer face of said back ring member.

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

JAMES A. WATKINS.

Witnesses:
FREDERICK R. STILL,
EDWIN BREDE.