

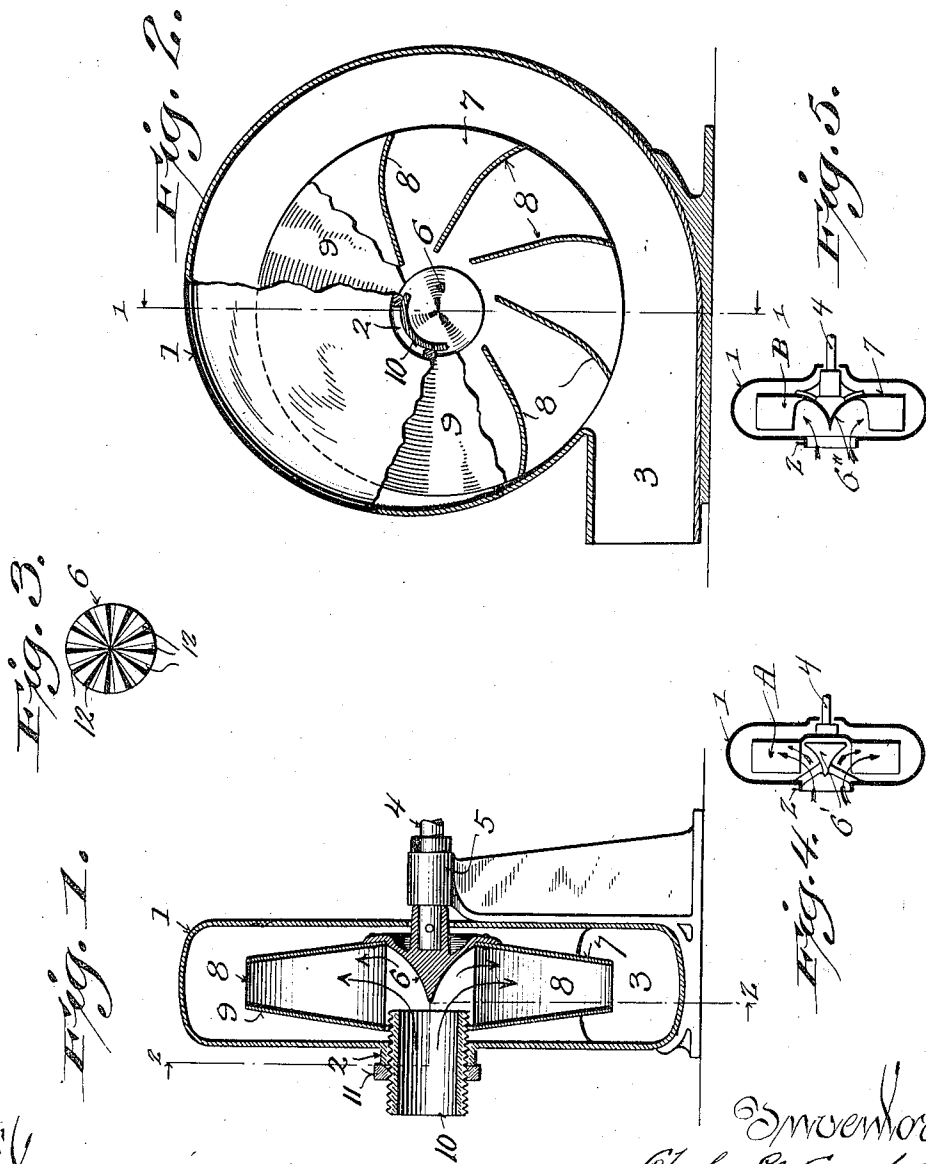
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CENTRIFUGAL FAN.

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1,053,154.

Patented Feb. 18, 1913.



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UNITED STATES PATENT OFFICE.

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CENTRIFUGAL FAN.

1,053,154.

Specification of Letters Patent.

Patented Feb. 18, 1913.

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To all whom it may concern:

Be it known that we, CHARLES G. CAMPBELL and MONROE BENBROOK, both citizens of the United States, and residents of Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Centrifugal Fans; and we do hereby declare that the following is a full, clear, and exact description thereof.

Our invention refers to centrifugal fans wherein air is introduced axially and discharged peripherally of the fan-casing through the action of any type of fan therein, the object of the invention being to produce a centrifugal fan which will operate with the least expenditure of power in ratio to the resistance to be overcome, said fan being particularly adapted for use in the production of a vacuum.

Heretofore as far as we are aware the inrush of air at the fan axis is met with an abrupt face that offers great frictional resistance incidental to change of the direction of the air from the axial point to the shedding point of the blades, the said frictional resistance causing back pressure resulting in material loss of power and efficiency, this being especially so in connection with vacuum producing fans.

Our invention contemplates overcoming the above objectionable features of fans of this character by the employment of a conical deflector which is disposed axially of the fan opposite the air intake of the casing. By the interposition of this cone it is apparent that the change of the direction of air on entering the fan-casing is effected with the least resistance, the same being spread or deflected radially into a thin sheet that is evenly distributed to the blades. Thus accumulation of air current at the axis of the fan is eliminated whereby greater efficiency and reduction in power expended is the result.

Another object of the invention is to provide means for adjusting the area of the air intake opening of the fan whereby the volume of air is correctly proportioned relative to the speed and capacity of the fan.

Our present invention is designed to be used particularly in connection with vacuum creating apparatus such as disclosed in

our application for patent, Serial Number 682362, filed March 8, 1912.

With the above objects in view the invention consists in certain peculiarities of construction and combination of parts as hereinafter more fully set forth with reference to the accompanying drawings and subsequently claimed.

In the drawings Figure 1 represents a longitudinal sectional view of a fan embodying the features of our invention, the section being indicated by line 1—1 of Fig. 2; Fig. 2, a face view of the same with parts broken away and parts in section to more clearly illustrate the details of construction; Fig. 3 illustrates another form of cone from that shown in Figs. 1 and 2, wherein the face of the cone is serrated; Fig. 4, a diagrammatic view upon a small scale of another form of our invention applied to a centrifugal fan, and Fig. 5, a similar view of still another form of our invention.

Referring by characters to the drawings, 1 represents a fan-casing of the snail-shell type having the usual eccentric circular air intake 2, and a peripheral air discharge opening 3, the same being tangentially disposed with relation to the circumference of the casing. A driving shaft 4 is axially alined with the intake opening 2 and is journaled in a bearing bracket 5 of any desired type. As shown in Figs. 1 and 2, this shaft projects into the casing, and has secured thereto a conical deflector 6, the point of which is disposed opposite the casing intake opening. The conical deflector in this instance constitutes a hub to which is attached a backing-plate 7 that carries the usual series of vanes or blades 8. The front edges of the blades are suitably connected to a disk 9, which disk in conjunction with the backing-plate forms a housing for said blades, it being understood that the disk is centrally apertured to form a receiving opening whereby communication is established between the fan-blades and air intake opening 2 of the casing. In order to provide for adjusting the air intake opening the wall of the same is threaded for the reception of an exteriorly threaded tubular throat 10, the inner or discharge mouth of which is arranged to be adjusted relative to the conical deflector, whereby the air passage is re-

stricted or increased as the case may require, said tubular throat being held in its adjusted position by a lock-nut 11, which impinges against the outer face of the air intake 2 of the casing.

From the foregoing description it is apparent that when air is admitted through the throat or air intake opening that it will strike the point of the cone and thus be dispersed radially into a thin curved sheet, which sheet is directed toward the periphery of the fan, evenly throughout its circumference, the face of the cone serving to instantly change the air from an axial direction by a gentle curve to a radial direction with respect to the said fan. This spreading of the air by the cone incidental to its entrance at the axis will overcome any tendency of bunching or pocketing the air at this point and the action tends rather to produce vacuum, whereby the intake opening is rendered free to receive a greater volume of air, and hence when said fan is utilized as either a vacuum producer or blower, the vacuum efficiency is increased while the force expended is proportionately reduced.

In some instances, as shown in Fig. 3, we may provide the face of the conical deflector with serrations 12, whereby greater surface area is presented and the air is more readily broken up into spray form whereby a series of thin even sheets of air are distributed to the fan blade as it strikes said face, it being understood however, that while we have shown the serrations disposed radially that they may be in spiral or any other suitable form desired to produce the result.

Fig. 4 illustrates a form of the invention wherein the conical deflector 6' is connected to the fan-casing and is therefore non-rotary, the fan A in this instance being revolved about the conical deflector.

Fig. 5 illustrates another form of the invention wherein the backing-plate 7' of the fan B is formed in one piece with the conical deflector 6'', it being understood that the fan-casing in either the form shown in Fig. 4 or 5 is practically of the same type as that illustrated in Figs. 1 and 2.

In connection with describing our invention we have illustrated and specifically

mentioned a conical deflector provided with a concaved circular surface against which the intake air contacts. It should be understood however, in some instances, we may, without departing from the spirit of our invention, use a polygonal form for the deflector surface.

We claim:

1. In a centrifugal fan having a casing provided with an air intake and peripheral discharge, and a fan mounted within the casing in axial alinement with the air intake; the combination of a conical deflector arranged opposite the air intake, and means for adjusting the air intake opening relative to said conical deflector.

2. A centrifugal fan comprising a casing provided with an air intake and peripheral discharge, a fan mounted within the casing, and a sleeve in connection with the air intake adjustable toward and from the back of the fan to increase or restrict the aforesaid intake opening.

3. In a centrifugal fan; the combination of a casing provided with an air intake opening and peripheral discharge, a fan mounted within the casing in axial alinement with the air intake, and a conical deflector carried by said fan, a sleeve mounted within the casing air intake opening, and means for adjusting said sleeve relative to the face of the conical deflector for increasing or restricting the aforesaid intake opening.

4. In a centrifugal fan having a casing provided with an air intake and peripheral discharge, a fan mounted within the casing in axial alinement with the air intake, and a conical deflector carried by said fan; the combination of a sleeve in threaded union with the fan casing intake opening, the mouth of the sleeve being in axial alinement with the conical fan deflector.

In testimony that we claim the foregoing we have hereunto set our hands at Milwaukee in the county of Milwaukee and State of Wisconsin in the presence of two witnesses.

C. G. CAMPBELL.
MONROE BENBROOK.

Witnesses:

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M. E. DOWNEY.