No. 673,477. Patented May 7, 1901.

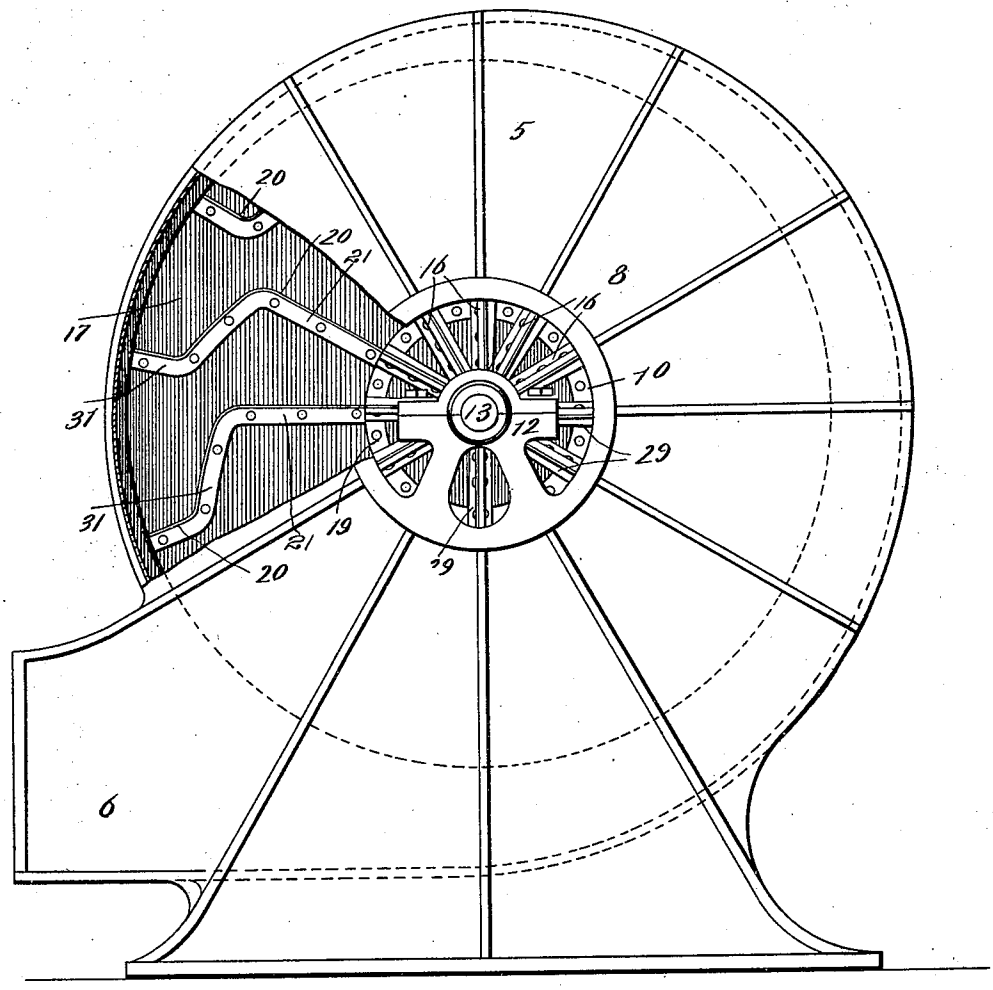
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FAN.

(Application filed Oct. 31, 1900.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.



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(No Model.) 2 Sheets—Sheet 2.

Fig. 2.

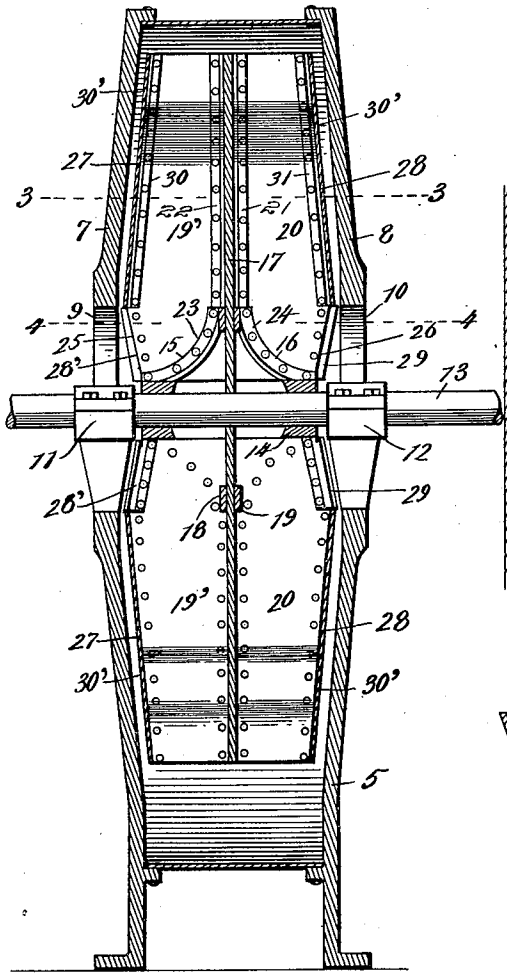


Fig. 3.

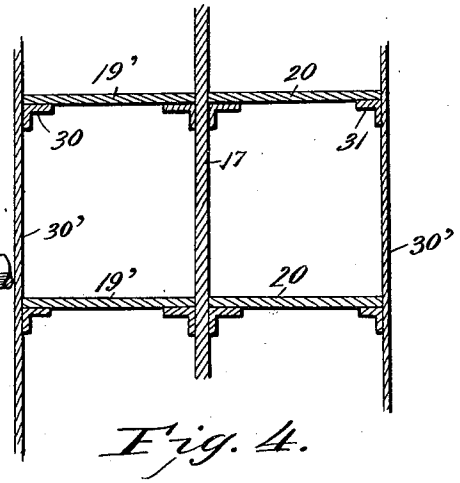
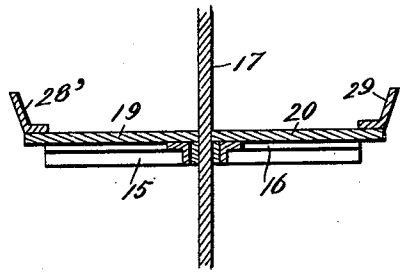


Fig. 4.



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UNITED STATES PATENT OFFICE.

JAMES R. ROBINSON, OF MONONGAHELA, PENNSYLVANIA.

FAN.

SPECIFICATION forming part of Letters Patent No. 673,477, dated May 7, 1901.

Application filed October 31, 1900. Serial No. 35,052. (No model.)

To all whom it may concern:

Be it known that I, JAMES R. ROBINSON, a citizen of the United States, residing at Monongahela, in the county of Washington and State of Pennsylvania, have invented a new and useful Fan, of which the following is a specification.

This invention relates to fans in general, and more particularly to that class of fans designed for use in mines and in other places where it is desired to supply air under high pressure or to exhaust air where great suction is required, one object of the invention being to provide a simple and efficient construction of fan which may be used for exhausting or for forcing air and which may be operated with an economic expenditure of energy.

An additional object of the invention is to provide a fan which may draw in the air at the hub thereof and force it from the periphery by centrifugal action and wherein the tendency to back pressure and sliding of the air from the blades of the fan will be prevented.

Further objects and advantages of the invention will be evident from the following description.

In the drawings forming a portion of this specification, and in which like numerals of reference indicate similar parts in the several views, Figure 1 is a side elevation showing the complete fan, a portion of the casing being broken away to illustrate the shape of the blades. Fig. 2 is a vertical central section taken through the fan and its casing. Fig. 3 is a section on line 3 3 of Fig. 2 and showing the means at the edges of the blades for preventing the air from slipping from the blades. Fig. 4 is a section on line 4 4 of Fig. 2 and showing the supplemental blades which are pitched to draw the air in at the hub of the fan, these supplemental blades being, in effect, screw-blades.

In the drawings there is shown a casing 5, the periphery of which progresses spirally from the center or axis of the casing, and from which casing at its point of greatest eccentricity there leads a discharge-pipe 6, which is tapered vertically in the direction of its discharge end. In the ends of heads 7 and 8 of the casing 5 and concentric therewith are formed annular inlet-openings 9 and and 10, the material of the heads of the casing being increased in thickness at the edges of these openings for purposes of strengthening, and from these thickened portions spring pillow-blocks 11 and 12, having bearings therein which receive the shaft 13 of the fan. It will be noted upon reference to Fig. 2 of the drawings that the casing is greater in width at the center than at the periphery and that it tapers toward the periphery. Upon the shaft 13 is fixed the fan, comprising a hub 14, the ends of which lie in close proximity to the inner ends of the pillow-blocks, whereby said blocks may limit lateral movement of the hub to prevent the blades of the fan, hereinafter described, from striking against the heads of the casing. At each end of the hub are fixed a series of castings 15 and 16, respectively, the castings of each series when assembled presenting the frustum of a concaved cone, including detached sections divided in planes including the axis of the cone. Each of these detached sections is represented by an individual casting. These two frusto-conical groups of castings are fixed upon their respective end portions of the hub with their bases toward each other and separated by a slight interspace sufficient to receive a disk or diaphragm 17, which lies at right angles to the shaft, and to the faces of this diaphragm are riveted rings 18 and 19, concentric with the diaphragm and against which the castings are secured. Between the castings of each series 15 and 16 are disposed fan-blades 19′ and 20, respectively, the series 19′ of blades lying at one side of the diaphragm and the series 20 at the opposite side, and these two series of blades aline in pairs and are held against displacement by means of angle-rails 21 and 22, which are riveted to the diaphragm and to the inner edges of the blades. The blades are also riveted at their inner ends to the flanges 23 and 24 upon the castings 15 and 16.

Those portions of the blades of the fan that are exposed by the openings 9 and 10 are tapered in the direction of the axis of the wheel, as shown at 25 and 26, while from the edges of the openings the blades are tapered in the directions of their outer ends, as shown at 27

and 28. On those faces of the blades that are in advance during the operative rotation of the fan and at the edges 25 and 26 thereof are secured angular plates 28 and 29, one flange of each of which is riveted to its respective fan-blade, while the opposite flange projects beyond the edge of the blade and at an obtuse angle to the blade in the direction of its rotation, and as these flanges of the angular plates project beyond the edges of the blades they have the effect of gathering the air and shooting it inwardly against the castings 15 and 16, by which it is deflected radially of the fan through the interspaces between the blades. To prevent the air from spilling over the edges of the blades, angular plates or rails 30 and 31 are secured by riveting or otherwise at the edges 27 and 28 thereof, these plates or rails being attached to the rear faces of the blades and to end plates 30′, reaching from plates 28 and 29 to ends of fan-blades.

To increase the centrifugal action of the blades of the fan, each of the blades is taken radially from the hub through about two-thirds of the radius of the fan, after which it is bent at an obtuse angle in a direction opposite to the direction of motion, while the outer sixth of the blade is brought to lie radially of the fan. In practice these proportions may of course be varied.

With this construction it will be seen that there is in reality a double fan, one element of which is at each side of the central diaphragm, so that the air that is taken in at the hub of the fan is discharged in two streams at the periphery of the fan.

It will be noted upon reference to Fig. 1 of the drawings that the tips of the fan-blades most nearly approach the inner periphery of the casing at a point just above the discharge-pipe, while the greatest separation is at the lower side of the discharge-pipe, so that the interspace between the tips of the blades gradually increases to the discharge-pipe. The object of this arrangement is to provide space to receive the gradually-increasing volume of air passing to the discharge-pipe.

As the fan rotates the air is discharged from the tips of the blades, and the greater the speed of rotation of the fan the greater the pressure under which the air in the casing is placed. This high pressure of the air between the fan and the periphery of the casing of course tends to oppose the passage of air from the fan, and to prevent this opposition rising to a degree sufficient to cause the air to slide back along the blades the back curvature or displacement above described is given to the blades.

It will be understood that the shaft of the fan may have connection with rotating means in any suitable manner, either direct or indirect, and that in practice various modifications of the specific construction shown may be made and any suitable materials and proportions used for the various parts without departing from the spirit of the invention.

What is claimed is—

1. A device of the class described comprising a casing and a fan rotatably mounted therein, said fan including a plurality of blades, the inner and outer end portions of each blade lying radially of the fan and the intermediate portion being rearwardly directed.

2. A device of the class described comprising a casing and a fan rotatably mounted therein, each of the blades of the fan being continuous and comprising inner and outer portions offset with respect to each other and lying radially of the fan, and an intermediate portion connecting the inner and outer portions.

3. A device of the class described comprising a casing and a fan rotatably mounted therein, each of the blades of the fan being continuous and comprising inner and outer portions which are offset with respect to each other and lie radially of the fan, and a connecting portion lying at an obtuse angle to the first-named portions.

4. A fan having blades, each of which is continuous and includes an inner portion and an outer portion of which one is offset with respect to the other and both of which lie radially of the fan, and a connecting portion for the first-named portions.

5. A fan having blades, each of which is continuous and includes an inner portion and an outer portion of which one is offset with respect to the other and both of which lie radially of the fan, and a connecting portion lying at an obtuse angle to the first-named portions.

6. A device of the class described comprising a casing having inlet and outlet openings at the center and periphery thereof, and a fan mounted rotatably within the casing, said fan including a plurality of blades having outwardly and forwardly directed flanges adjacent to the inlets to engage and shoot the air inwardly of the fan, each of the blades including inner and outer portions lying radially of the fan and relatively offset rotatably of the fan and having a connecting portion.

7. A device of the class described comprising a casing having central inlet-openings and a peripheral discharge-opening, a fan rotatably mounted within the casing and including a plurality of blades, flanges directed outwardly and forwardly from each of the blades at the side edges thereof adjacent to the inlet-openings, and end plates connected at the side edges of the blades beyond the first-named flanges, each of the blades including inner and outer portions lying radially of the fan and relatively offset rotatably of the fan and having a connecting portion.

8. A fan including a hub, blades attached to the hub, a diaphragm disposed at right angles to the axis of the hub and bisecting the blades, and deflecting devices between the

blades and formed to deflect radially of the diaphragm, each of the blades including inner and outer portions lying radially of the fan and relatively offset rotatably of the fan and having a connecting portion.

9. A device of the class described comprising a casing having inlet-openings formed centrally of its ends and having a peripheral outlet-opening, a fan rotatably mounted in the casing and comprising a hub, a diaphragm disposed intermediate of the ends of the hub and at right angles thereto, blades disposed at each side of the diaphragm, outwardly and forwardly directed flanges at the edges of the blades at the inlet-openings, end plates connected at the edges of the blades beyond the first-named flanges, and deflectors disposed between the blades and disposed to deflect from the inlet-openings radially of the diaphragm, each of the blades including inner and outer portions lying radially of the fan and relatively offset rotatably of the fan and having a connecting portion.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

JAMES R. ROBINSON.

Witnesses:
E. H. FOULKE,
GEO. T. LINN.