

C. F. BAKER.
AIR FORCING APPARATUS.
APPLICATION FILED JAN. 18, 1911.

990,948.

Patented May 2, 1911.

3 SHEETS—SHEET 1.

Fig. 1.

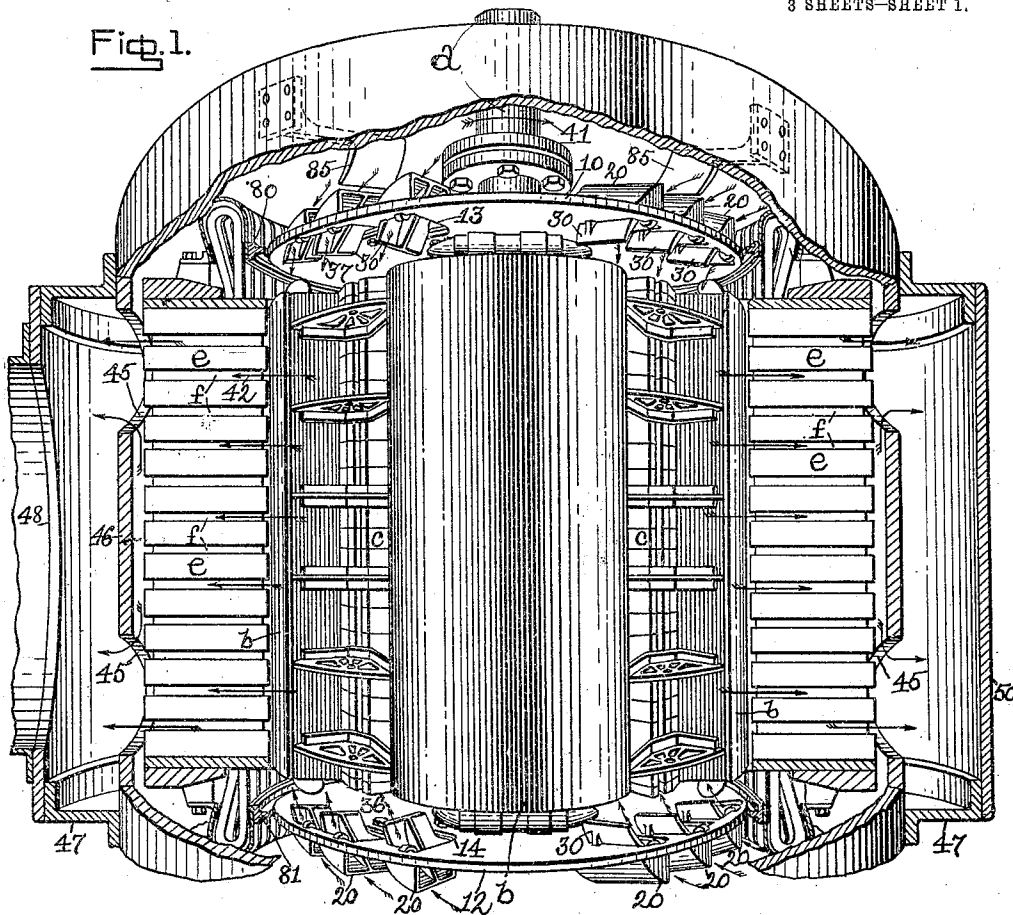


Fig. 2.

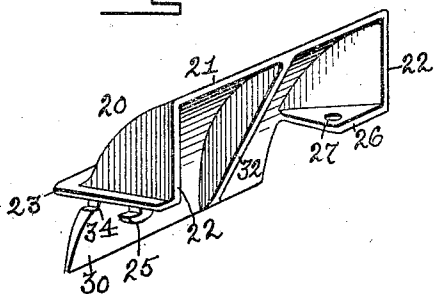
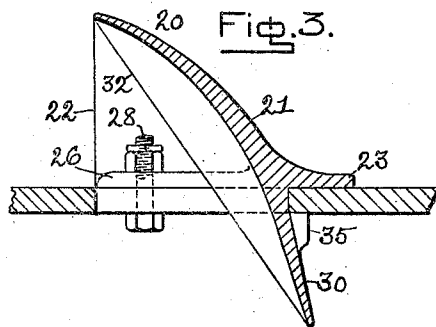


Fig. 3.



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3 SHEETS—SHEET 2.

Fig. 4.

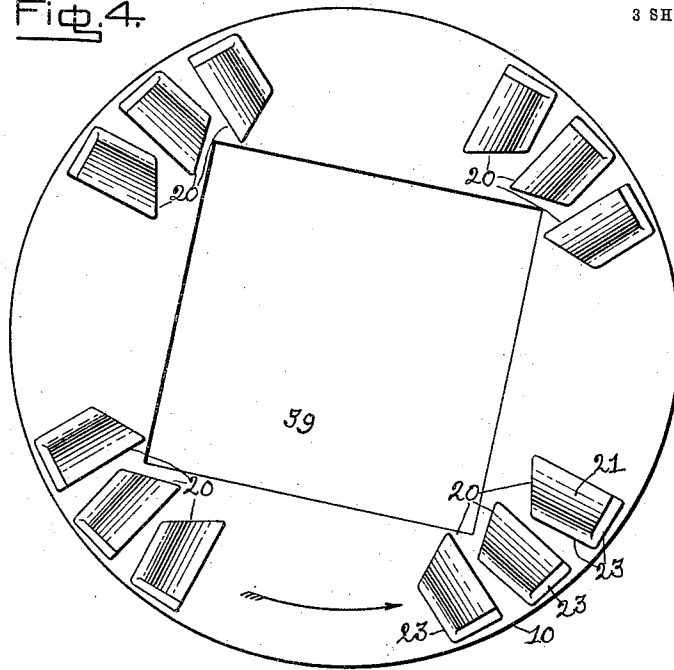
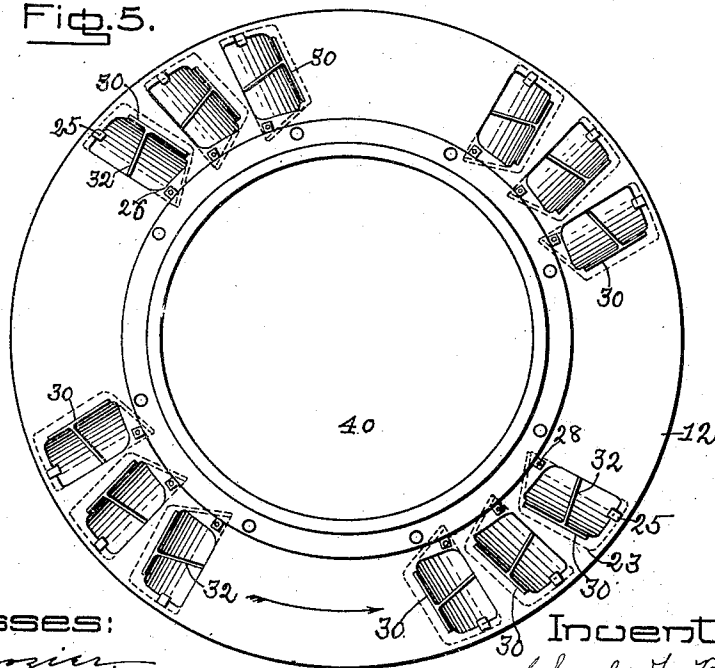


Fig. 5.



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3 SHEETS—SHEET 3.

Fig. 6.

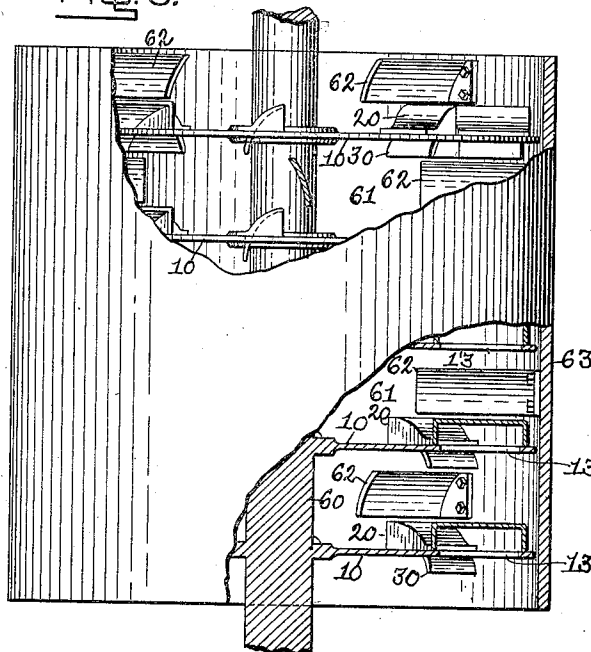
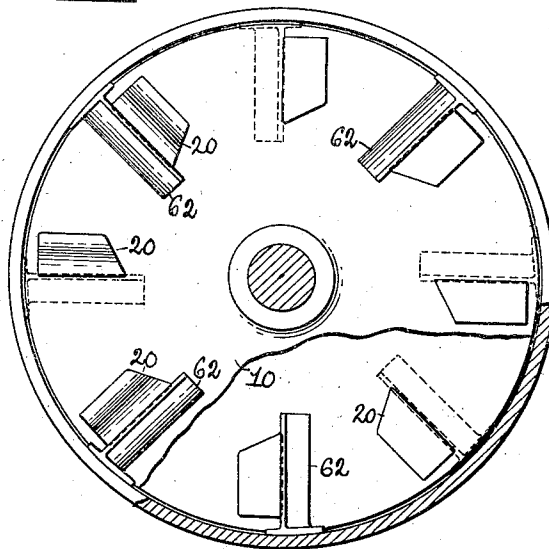


Fig. 7.



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AIR-FORCING APPARATUS.

990,948.

Specification of Letters Patent.

Patented May 2, 1911.

Application filed January 18, 1911. Serial No. 603,314.

To all whom it may concern:

Be it known that I, CHARLES F. BAKER, a citizen of the United States, residing in Newton, county of Middlesex, and State of Massachusetts, have invented an Improvement in Air-Forcing Apparatus, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

This invention relates to an air forcing or blowing apparatus in which a revolving member is provided with a disk or plate at one or both ends of a stationary cylinder or casing, one or both of said disks or plates being provided with buckets, vanes or cups located on the outside of the same and co-operating with openings in said disks or plates to force air through the said openings into the casing, and preferably having on the inner side of said plates or disks a second set of vanes, which act to force the air within the casing to the circumference of the same after the manner of a centrifugal fan on blower.

The revolving member of the apparatus may be the rotor of an electric generator, such as commonly employed in power houses, and the stationary member or casing may be the stator of the generator having ventilating ducts or passages extended radially through or between the laminations of the stator. The stator may be surrounded by casing having a suitable opening for the outlet of the air and for the purpose of cleaning the said passages.

The casing referred to, may discharge the air directly into the room in which the generator is located, or it may be a closed casing and provided with an outlet pipe leading to the outside of the room, or it may be located in a second casing having an outlet pipe leading to the outside of the room. By means of the air blowing apparatus, the capacity of the generator may be largely increased, owing to the efficient manner in which the generator is cooled.

These and other features of this invention will be pointed out in the claims at the end of this specification.

Figure 1 is a perspective view with parts broken away of an air-blowing apparatus embodying this invention. Figs. 2 and 3, details of the buckets, cups or vanes shown in Fig. 1. Fig. 4, a plan view of the top plate shown in Fig. 1. Fig. 5, a plan view

of the bottom plate shown in Fig. 1. Fig. 6, an elevation and section of a modified form of apparatus embodying the invention, and Fig. 7, a plan with parts broken away of the apparatus shown in Fig. 6.

Referring to Fig. 1, *a* represents the shaft of the rotor of an electric generator or motor of any suitable or well-known construction, such as now commonly employed in power houses of electric power plants, said rotor comprising the usual core or pole pieces *b*, which in the construction herein shown are separated from one another to leave longitudinal air openings *c*. The stator comprises a suitable core *d* and laminations *e*, which are separated to leave radial air passages *f* leading from the inner to the outer circumference of the stator.

The shaft *a* in accordance with this invention has fast on it, preferably at both ends of the rotor, namely, at the top and bottom of the same, plates or disks 10, 12, provided with a series of openings 13, 14, which are arranged to register with the passages *c* between the pole pieces *b*. In the present instance, the top plate 10 is provided with a group of three openings 13 coöperating with each air passage *c*, and the bottom plate 12 is provided with a like number of openings 14. The top plate 10 has coöperating with each opening a bucket, vane or cup 20, preferably made as herein shown, (see Figs. 2 and 3) and comprising a curved back portion or plate 21 and straight end walls or side pieces 22 and a base flange or rim 23, which latter is designed to bear against the outer surface of the top plate 10. The buckets or vanes 20 may be secured to the top plate 10 in any suitable manner and are herein shown as provided at one side or end with a hook 25 (see Fig. 2), which is designed to engage one end wall of the opening 13, and is provided at its opposite end or side with an in-turned flange 26 having a hole 27 for the passage of a bolt 28 by which the bucket is firmly secured to the top plate 10. The buckets or vanes 20 act to force the air through the openings 13 with which they co-operate.

The top plate 10 is provided on its opposite or underside with a second set of vanes 30, which act on the air after it passes through the openings 13 to force it outwardly toward the stator. The vanes 30 may be separate from the buckets or vanes

20, or, as is preferred, they may be integral therewith. In the present instance, the vanes 30 are formed by extending the back plate 21 beyond the base rim or flange 23 and making said extension substantially straight. The back plate 21 may be stiffened by a rib 32, (see Figs. 2 and 3). The vanes 30 may and preferably will be made wider than the openings 13 and are provided at one end with notches 34 into which extend the end walls of said openings.

The vane 30 is preferably provided on the rear surface below the base flange 23 with a lug 35, which is separated from the said flange by a space of a depth substantially equal to the thickness of the top plate 10 (see Fig. 3). The lug 35 coöperates with the base flange 23 to lock the buckets or vanes to the rear wall of the opening 13, and the notch 34 and hook 25 serve to lock the bucket or vane to one side wall of the opening 13, while the bolt 28 serves to fasten the bucket or vane to the other side wall of said opening.

The bottom plate 12 has secured to it like buckets or vanes, the buckets 20 being located on the outside or below the said plate and the vanes 30 above the said plate. In other words, the buckets or vanes attached to the bottom plate 12 are arranged reversely to the buckets or vanes attached to the top plate, so that the air is forced upwardly into the air spaces *c* by the vanes or buckets on the bottom plate and downwardly into said air spaces by the vanes or buckets attached to the top plate as indicated by the arrows 36, 37, in Fig. 1. In Fig. 4, the top plate 10 is shown with the buckets or vanes arranged in four groups of three each, and having a square opening 39 to fit a square collar or portion (not shown) on the rotor shaft *a*, and in Fig. 5, the bottom plate 12 is shown with a like number of groups, each composed of three buckets, and provided with a circular opening 40.

In operation with the apparatus shown in Fig. 1, and with the rotor revolving in the direction indicated by the arrow 41, air is forced by the buckets or vanes 20 through the openings 13, 14, in the top and bottom plates 10, 12, into the air spaces or chambers *c*, and said air has imparted to it by the vanes 30 a movement toward the circumference of the rotor and toward the stator and into the passages *f*, as indicated by the arrows 42. The air forced into the chambers or spaces *c* and thence out through the passages *f* absorbs some of the heat within the generator and reduces the temperature of the latter to such extent as to greatly increase its capacity. The heated air issuing from the passages *f* may escape into the room in which the generator is located through ports or openings 45 in a casing 46

surrounding the stator, but if it is desired to keep down the temperature of the generator room, the casing 46 may be inclosed within a substantially air-tight casing 47 into which the heated air is discharged through the ports or openings 45 and from which it is led to the outside of a building by a pipe 48. The outside casing 47 may be of sufficiently large diameter to permit a workman to enter therein through a substantially large opening, which is normally closed by a cover 50. This arrangement affords opportunity for cleaning the passages *f* in the stator, as by an air blast in the hands of the workman, which air blast is applied to the outer ends of the passages *f* so as to cause it to pass through the passages *f* in a reverse direction to that indicated by the arrows 42. In the present instance, the top and bottom disks or plates 10, 12, are shown as provided with openings 13, 14, and with buckets or vanes coöperating therewith, and while I may prefer to employ both plates, I do not desire to limit the invention in this respect, as good results may be obtained with the use of a single disk or plate, either at the top or bottom.

In Fig. 1, the top plate 10 and the bottom plate 12 coöperate with the rings 80 81, respectively, which are secured to the ends of the stator coils or winding, to form with the stator a casing, which is substantially air-tight at its top and bottom and is provided with the air outlets *f* intermediate of its ends, which arrangement serves to increase the effectiveness of the apparatus in causing the air to be forced into the casing through the openings in the top and bottom plates 10, 12, and out through the lateral openings *f*. If desired the buckets of the top and bottom plates may have coöperating with them stationary vanes, blades or baffle plates, whereby the buckets or vanes carried by the top and bottom plates may more effectively force the air through the openings in said plates. In the present instance, I have shown in Fig. 1, such baffle plates 85 only in connection with the buckets of the top plate 10, said baffle plates being suitably attached to the casing 46 and while I may use such baffle plates in connection with an electric generator as shown in Fig. 1, I do not desire to limit the invention in this respect as good results may be obtained without them. Furthermore, I have herein shown the invention as embodied in an electric generator in which the revolving disks or plates having the openings therein and the buckets or vanes coöperating therewith, are affixed to the rotor thereof, but I do not desire to limit the invention in this respect, as the revolving disks or plates may be embodied in what may be termed a multi-stage blower after the manner represented in Figs. 6 and 7, wherein a plurality of plates, such

as the top plate 10 of the apparatus shown in Fig. 1 are arranged on a rotatable shaft 60 at suitable distances apart, to form a plurality of chambers 61 in which are located a series of stationary vanes, baffle plates or abutments 62, which are secured to the stationary casing 63 and which are preferably curved in a reverse direction to the buckets 20, so that the air from one chamber is forced by the buckets 20 through the openings 13 in one of the disks or plates 10 and by the vanes 30 is caused to strike against the stationary vanes 62, which reverse the current of air and cause it to be deflected, so as to be caught by the buckets 20 of the next lower plate or disk 10 and be forced through the openings 13 into the next lower chamber 61, where it is again deflected in the reverse direction. This operation is repeated through the succeeding chambers 61 until the air passes out from the last chamber.

The apparatus shown in Figs. 6 and 7 may be used as a blower by means of which air pressures suitable for many purposes can be obtained that are not within the practical range of blowers of the type now commonly used.

I have herein shown the invention as embodied in a rotor of one type, but I do not desire to limit myself to the particular type of rotor herein shown, as it is applicable to other types of rotor than that herein shown.

Claims.

1. In an apparatus of the character described, in combination, an electrical generator comprising a stator having laminations arranged to form air passages, a rotor having a series of pole pieces separated to form longitudinally extended air spaces, a plate secured to said rotor and provided with openings which register with said air spaces, buckets or vanes carried by said plate on one side thereof and cooperating with said openings to force air through the latter, and a second set of vanes carried by said plate on the opposite side thereof and acting on the air after it has passed through said openings, a casing inclosing said stator and provided with ports or openings, and a second casing inclosing the first-mentioned casing and provided with an air outlet pipe, said second casing having a removable section, substantially as described.

2. In an apparatus of the character described, in combination, an electrical generator comprising a stator having laminations arranged to form air passages, a rotor having a series of pole pieces separated to form longitudinally extended air spaces, a plate secured to said rotor and provided with openings which register with said air spaces, buckets or vanes carried by said plate on one side thereof and cooperating with said openings to force air through the

latter, and a second set of vanes carried by said plate on the opposite side thereof and acting on the air after it has passed through said openings, a casing inclosing said stator and provided with ports or openings, substantially as described.

3. In an apparatus of the character described, in combination, an electrical generator comprising a stator having laminations arranged to form air passages, a rotor having a series of pole pieces separated to form longitudinally extended air spaces, a plate secured to said rotor and provided with openings which register with said air spaces, buckets or vanes carried by said plate on one side thereof and cooperating with said openings to force air through the latter, and a second set of vanes carried by said plate on the opposite side thereof and acting on the air after it has passed through said openings, substantially as described.

4. In an apparatus of the character described, in combination, an electrical generator comprising a stator having laminations arranged to form air passages, a rotor having a series of pole pieces separated to form longitudinally extended air spaces, a plate secured to said rotor and provided with openings which register with said air spaces, and curved buckets carried by said plate on one side thereof and cooperating with said openings to force air through the latter, and a second set of vanes attached to said curved buckets and extended through the openings to the other side of said plate, substantially as described.

5. The combination with a machine having a rotor, and a stator provided with a plurality of openings in it extended from the inner to the outer surface thereof, of buckets or vanes at the ends of the rotor constructed to force air from both ends of the rotor longitudinally of the same toward the center thereof and laterally out through the openings in the stator, substantially as described.

6. The combination with a machine having a rotor and a stator provided with openings in it extended from the inner to the outer surface thereof, of a plate attached to the rotor to revolve therewith and provided with openings in it, and buckets or vanes carried by said plate and projecting from the outer surface thereof and registering with said openings, said buckets or vanes being constructed to force air through the openings in the said plate and longitudinally of the rotor, substantially as described.

7. In an apparatus of the character described, in combination, a rotatable member, a disk or plate carried by said rotatable member and provided with an opening in it, a bucket or vane carried by said disk or plate and projecting from the outer surface thereof and registering with said opening to

force air therethrough, and a vane carried by said disk or plate and located on the opposite side of the same to act on the air forced through said opening by the first-mentioned bucket or vane, substantially as described.

8. In an apparatus of the character described, in combination, a rotatable member, a disk or plate carried by said rotatable member and provided with an opening in it, and a bucket or vane carried by said disk or plate and having end walls and a curved back portion which projects over the said opening and forces the air through said opening, substantially as described.

9. In an apparatus of the character described, in combination, a rotatable member, a disk or plate carried by said rotatable member and provided with an opening in it, and a bucket or vane carried by said disk or plate and having end walls extended from the plate and a back wall connecting said end walls and extended from their outer ends toward said plate to deflect the air through said opening, substantially as described.

10. In an apparatus of the character described, in combination, a rotatable member, a plurality of disks mounted thereon to revolve therewith and separated from each other and provided with openings, buckets or vanes carried by said disks and cooperating with said openings to force air there-through, into the space between said disks, a casing inclosing said disks, and stationary vanes in said casing extended between adjacent disks and cooperating with the said buckets or vanes, substantially as described.

11. In an apparatus of the character described, in combination, a rotatable member, a disk or plate carried by said rotatable member and provided with an opening in it, a bucket or vane carried by said disk or

plate and projecting from one surface thereof and registering with said opening to force air therethrough, and a stationary blade or vane cooperating with the said bucket or vane to oppose the current of air created by said bucket or vane, substantially as described.

12. In an apparatus of the character described, in combination, a rotatable member, a disk or plate carried by said rotatable member and provided with an opening in it, a bucket or vane carried by said disk or plate and projecting from the outer surface thereof and registering with said opening to force air therethrough, and means cooperating with said disk to form a substantially air-tight joint therewith, substantially as described.

13. In an apparatus of the character described, in combination, a stator, a rotor, disks or plates mounted on the rotor to revolve therewith and provided with openings, and buckets or vanes carried by said disks and projecting outwardly therefrom and registering with said openings to force air from both ends of the rotor inwardly through said openings longitudinally of the rotor, substantially as described.

14. In an apparatus of the character described, in combination, a stator, a rotor, a disk or plate movable with said rotor and provided with openings, buckets or vanes carried by said disk and extended outwardly therefrom and registering with said openings, and stationary vanes cooperating with said buckets, substantially as described.

In testimony whereof, I have signed my name to this specification in the presence of two subscribing witnesses.

CHARLES F. BAKER.

Witnesses:

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J. MURPHY.