I. H. SPENCER.

APPARATUS FOR FORCING AIR.

APPLICATION FILED JAN. 9, 1907.

982,393. Patented Jan. 24, 1911.

FIG. 1.

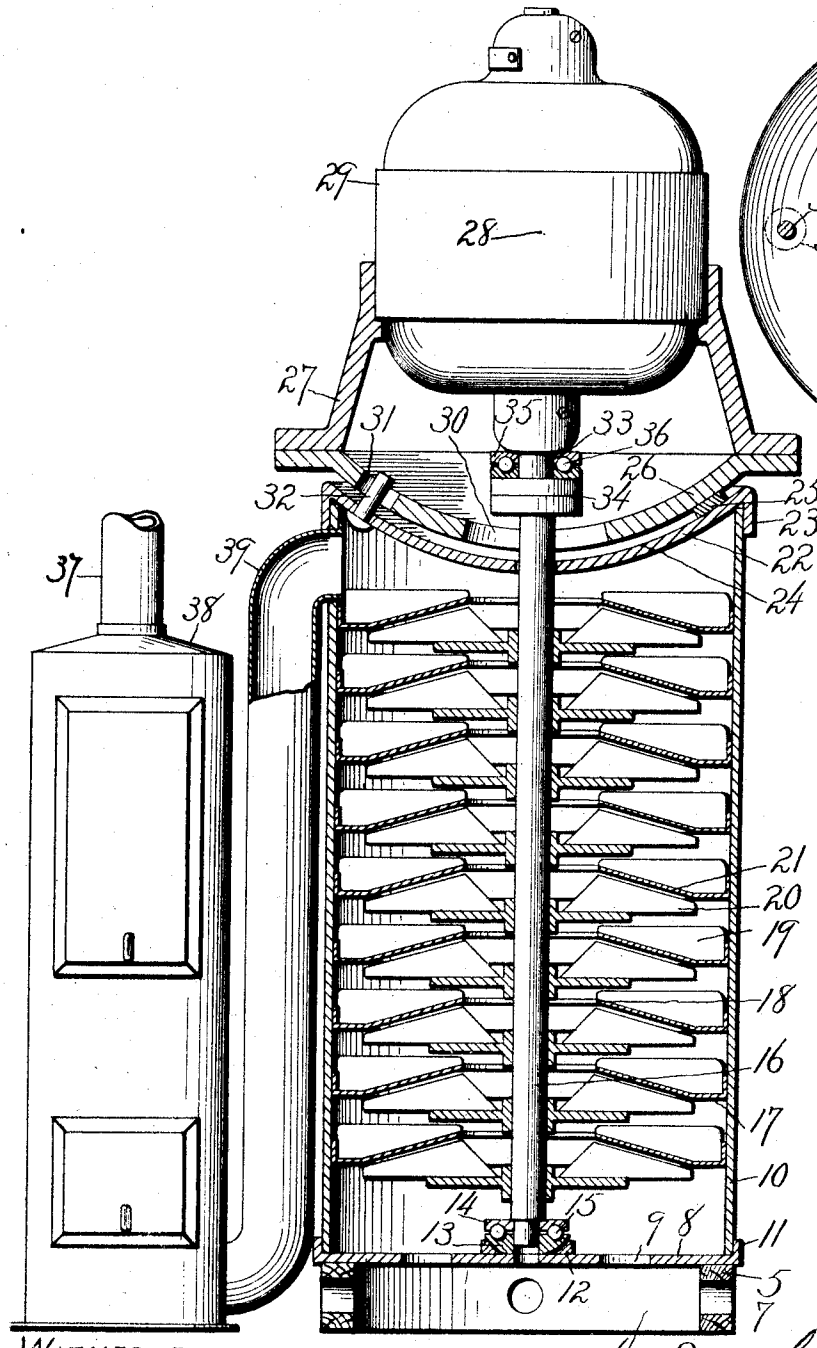
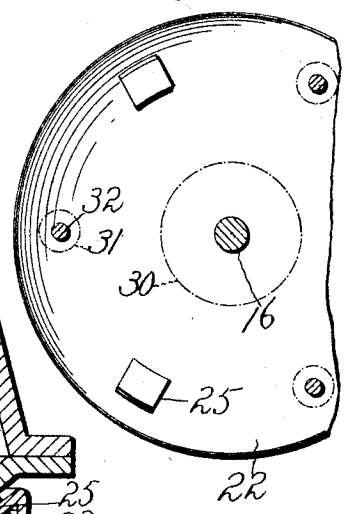


FIG. 2.



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APPARATUS FOR FORCING AIR.

982,393. Specification of Letters Patent. **Patented Jan. 24, 1911.**

Application filed January 9, 1907. Serial No. 351,447.

To all whom it may concern:

Be it known that I, IRA H. SPENCER, a citizen of the United States, and a resident of Hartford, in the county of Hartford and State of Connecticut, have invented a new and Improved Apparatus for Forcing Air, of which the following is a specification.

My invention relates to the class of devices employed for supplying air to or withdrawing it from a chamber or receptacle, and the object of my invention is to provide a device of this class in which the movement of the parts shall be comparatively free; and a further object of the invention is to provide a device that shall be extremely compact and occupy a minimum amount of floor space; and a further object of the invention is to provide extreme simplicity in the means for adjusting the several parts. A form of device in the use of which these objects may be attained is illustrated in the accompanying drawings, in which—

Figure 1 is a view partially in central vertical section of a device embodying my invention. Fig. 2 is a view in cross-section through the device on a line passing between the motor base and its support, the dust receiver and connecting pipe being removed; the openings for the shaft and studs are illustrated in dotted outline.

My invention is not limited in its use to an apparatus for creating a flow of air for any special purpose but will be found readily applicable to devices for producing air currents for wide and varied uses.

In the accompanying drawings the numeral 5 denotes a base for supporting the shell of the apparatus. This base has a chamber 6 and may be constructed of any desired material, as wood, iron, or other metal of proper form to provide the chamber 6. The chamber 6 may be supplied with air outlets in any desired manner. In the form shown it is open at the bottom, and when the apparatus is set up the under edges of the base 5 may be located at such distance from the floor or other support as to allow air to pass underneath the chamber 6, and in addition thereto outlet passages 7 through the side walls of the base 5 may be employed for passing air from the chamber. These outlet passages may be provided in any desired number, and should the base be set with its under edge against the floor of the support said outlet passages may constitute practically the sole means of passing air from the chamber 6.

A base plate 8 rests upon the base 5 and is provided with air passages 9 communicating with the chamber 6 and also with a chamber in a shell 10 mounted on the base plate. In the preferred form of construction the base 5 and plate 8 are of circular form, the latter being provided with an annular flange 11 within which the end of the shell 10 is located. This shell is of circular form, preferably of iron, and of a size in diameter and length to properly perform the amount of work for which the apparatus is designed. The shell 10 is set on end with its axis vertically arranged. The step bearing, including a seat 12, a ball base 13 and a shaft supporting plate 14, is located on the base plate 8. The seat 12 is secured to the base plate and has a sperically formed recess within which fits the spherically formed bearing surface of the ball base 13. Balls 15 are located in grooves in the adjacent surfaces of the shaft supporting plate 14 and ball base 12. A main shaft 16 has its lower end resting on this bearing which forms a step therefor.

At suitable intervals along the interior of the shell partitions 17 are located extending inward but each having a central opening 18 through which air may pass between the several chambers formed by these partitions. Wings 19 are located in each of the chambers formed by the partitions, these wings projecting from the partitions lengthwise of the shell but radially disposed with respect to the shaft 16, and each chamber contains any desired number of the wings. The partitions 17 extend for a short distance at right-angles to the axis of the shaft and are then inclined, each forming a conical recess 21 within which fans 20 project. These fans are secured to the shaft 16, any desired number being located in each of the chambers, and the fans as to their edges are formed to fit within the conical recesses 21 above described.

The upper end of the shell is closed by a motor supporting plate 22. This plate has a flange 23 closely fitting the outer surface of the shell and has a sperically formed recess 24. Bearing studs 25 are located at proper intervals within the recess 24. The motor supporting plate may be of cast metal

and the studs 25 may be secured thereto in any desired manner, being cast integral therewith, or, as herein shown, being separately formed. These studs, in the preferred form of construction, are three in number, disposed at equal distances each from the other and at proper distance from the periphery of the supporting plate. A motor base consisting of a movable support 26 and a standard 27 is mounted upon the supporting plate 22. The movable support is of spherical form and rests upon the studs 25. The recess 24 within the motor base 22 need not be of spherical form, but the bearing ends of the studs 25 are arranged approximately on the surface of a sphere and the bearing surface of the movable support is formed on a sphere with its center at the point 28 or center of the motor 29.

A central opening 30 larger than the diameter of the shaft 16 is formed through the movable support, and openings 31 for pins 32 projecting from the motor supporting plate 22 are also formed through the supporting plate. These allow for a movement of the plate 26 on the studs 25 within certain limits defined by the pins 32. The shaft 16 may be connected with the motor shaft 33 in any desired manner, flanges 34 being shown herein as a means of connection. This shaft as a whole has a certain limited lengthwise play, and a ball bearing plate 35 rests against the motor frame and balls 36 are interposed between this plate and one of the flanges 34 forming a thrust bearing for this end of the structure.

In the operation of the device the dust laden air passes through the inlet pipe 37 into the separator chamber 38, the latter being of any desired form and construction, and thence through the connecting pipe 39 to the upper end of the shell 10. The fans force the air downward into the chamber 6 and through the outlets 7. This action of the fans in forcing the air downward exerts a force in the opposite direction upon said fans and consequently upon the shaft 16. When the device is horizontally arranged this end thrust upon the shaft retards its movement to a marked degree, thus requiring increased power to rotate it and also requiring stronger construction of parts to resist such thrust. I have found by continued experiment that this end thrust upon the shaft may be relieved to a great degree and practically eliminated by setting the device on end with the inlet of the shell located at the upper part and the outlet at the bottom. The force on the shaft, in operation, being exerted toward that end of the shell containing the inlet, by thus arranging the device the weight of the shaft and attached parts is utilized to counteract the end thrust. As the force exerted by the fans is practically uniform from the amount of end thrust on the shaft can be so approximately determined as to enable the construction of shaft and attached parts of a weight, when vertically arranged, to counterbalance this end thrust upon the shaft. This enables the force upon the shaft to be practically eliminated, and the friction ordinarily present in the regular bearings, when the shaft is horizontally arranged, is also reduced to a minimum, producing what may be termed a "floating shaft." It will thus be seen that this arrangement not only reduces to a great extent the objectionable end thrust upon the shaft, but also decreases to a marked degree the friction in the regular bearings which is present when the parts are differently arranged.

The fan-blades 21 are secured to the upper surfaces of circular disks or plates 50 that in turn are mounted upon the shaft 16. As shown in Fig. 1 the blades extend out considerably beyond the edges of their supporting plates 50. The plates 50 operate as reaction plates or members changing the direction of the moving air, and in conjunction with the fan-blades, causing the uplifting action already described.

What I claim as my invention and desire to secure by Letters Patent is:—

1. The combination of a shell or casing, a vertically arranged shaft mounted to rotate in said casing, a base adjustably supported by said shell, means carried by said base for rotating said shaft, and interlocking means connected with the base for securing it in its adjusted positions.

2. The combination of a casing, a vertically arranged shaft mounted to rotate in the casing, a spherical-shaped support sustained by said casing, arranged to be adjusted, and provided with an opening through which the upper end of the shaft extends, and means carried by said base for rotating said shaft.

3. The combination of a shell or casing having a closing plate at its upper end, a vertically arranged shaft mounted to rotate in the casing, fans secured to said shaft, an adjustable support mounted on the said plate, the said shaft extending through the plate and the support, and means carried by the said support for rotating the said shaft.

4. The combination of a shell or casing having a closing plate at its upper end, a vertically arranged shaft mounted to rotate in the casing, fans secured to said shaft, an adjustable base supported by the said plate, means carried by the said base for rotating the said shaft, and interlocking means between the plate and the base for securing the base in its adjusted positions on the plate.

5. The combination of a casing having a closing plate at its upper end, a vertically arranged shaft mounted to rotate in the casing, a spherical-shaped support mounted

on the said plate, arranged to be adjusted, and provided with an opening through which the upper end of the shaft extends, and means carried by the said base for rotating the said shaft.

6. In an air forcing apparatus, the combination of a vertically disposed casing provided with an inlet opening near the top and an outlet opening near the bottom, a vertically disposed driven shaft arranged within the casing, bearings carried by the casing in which the shaft is mounted, a series of fans secured to the shaft at different levels and arranged to force the air downward through the casing, and partitions located within the casing and extending inward between the series of fans, the partitions being centrally perforated and inclining relative to the axis of the shaft from the said central openings toward their outer edges, the fans being shaped to approximately fit the chambers formed by the said inclined portions of the partitions and the operation of the fans serving to lift the shaft and counteract the end thrust at the bearings, the ends of the fan blades extending beyond the edges of the supporting plates.

7. In an air forcing apparatus, the combination of a vertically disposed casing having an inlet opening near its top and an outlet opening near its bottom, a vertically disposed shaft mounted therein, thrust bearings supporting the shaft, means for driving the shaft, a series of plates secured to the shaft one above the other, and fan-blades secured to the said plates arranged to move the air downward through the casing, the ends of the fan-blades extending beyond the edges of the supporting plates.

8. A shell having an inlet at its upper and an outlet at its lower part, a shaft vertically arranged and mounted to rotate in the shell, fans secured to said shaft to force air through the shell from the top to the bottom, a plate closing an opening at the upper part of the shell, said plate being recessed and having bearing projections, a movable base mounted on said projections, and a motor supported by the base.

9. A shell having an inlet at its upper and an outlet at its lower part, a shaft vertically arranged and mounted to rotate in the shell, fans secured to said shaft to force air through the shell from the top to the bottom, bearing studs with their ends spherically located at the upper end of the shell, a movable base mounted on said projections, a motor supported by the base, and an adjustable bearing for the shaft at the lower end of the shell.

10. A shell having an inlet at its upper and an outlet at its lower part, a shaft vertically arranged and mounted to rotate in the shell, fans secured to said shaft to force air through the shell from the top to the bottom, an adjustable bearing for the lower end of the shaft, a recessed plate closing the end of the shell and having bearing projections, a movable base with a spherically formed bearing surface resting upon said projections, and a motor mounted upon said base.

11. A shell, a shaft vertically arranged within said shell, fans secured to said shaft, an end plate for the shell having bearing studs, a movable base having a spherically formed surface to rest upon said studs, a motor upon said base and connected with said shaft, and an adjustable bearing for the opposite end of the shaft.

12. A shell, a shaft vertically arranged within the shell, fans secured to said shaft, a recessed plate closing the end of the shell, bearing studs located within the recess in said plate, a motor base having a spherically formed bearing surface resting upon said studs, a motor supported by the base and connected with said shaft, and an adjustable bearing for the opposite end of the shaft.

13. A shell, a shaft vertically arranged within said shell, an adjustable bearing for the lower end of the shaft, a bearing plate closing the opposite end of the shell, bearing studs having their ends spherically located, a movable base having a spherically formed bearing surface to rest upon said studs and an enlarged opening for said shaft, and a motor supported by said base and connected with said shaft.

14. A shell, a shaft vertically mounted within said shell, an adjustable bearing for the lower end of the shaft, a plate closing the opposite end of the shaft, studs having their outer ends spherically arranged and mounted on said plate, a movable base having a spherically formed bearing surface to rest upon said studs, and enlarged openings one for the reception of the shaft, pins projecting from the shell into said enlarged openings, and a motor mounted upon said base and connected with said shaft.

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