

Oct. 16, 1923

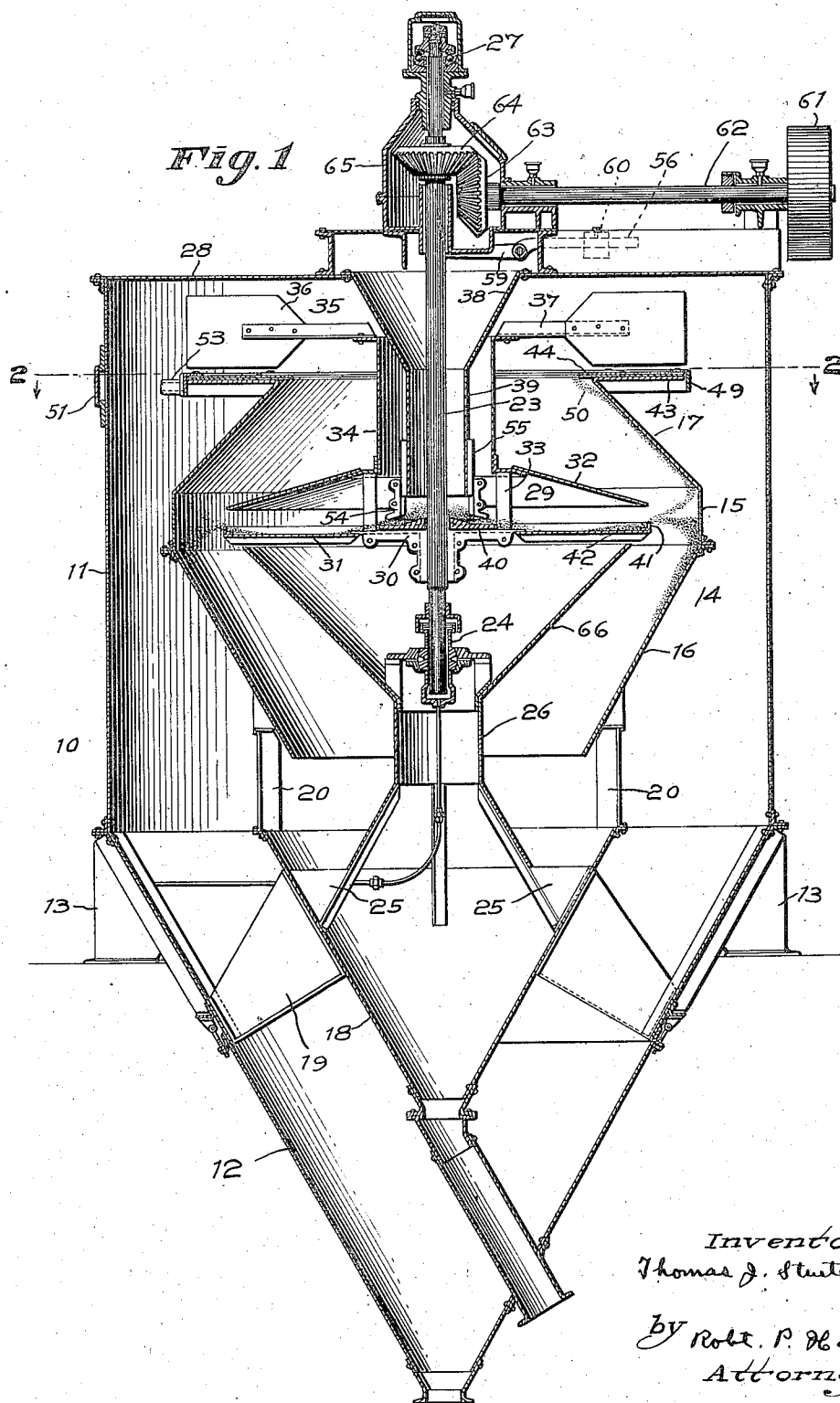
T. J. STURTEVANT

1,470,892

AIR SEPARATOR

Filed Aug. 26, 1921

3 Sheets-Sheet 1



Oct. 16, 1923.

1,470,892

T. J. STURTEVANT

AIR SEPARATOR

Filed Aug. 26, 1921

3 Sheets-Sheet 2

Fig. 2

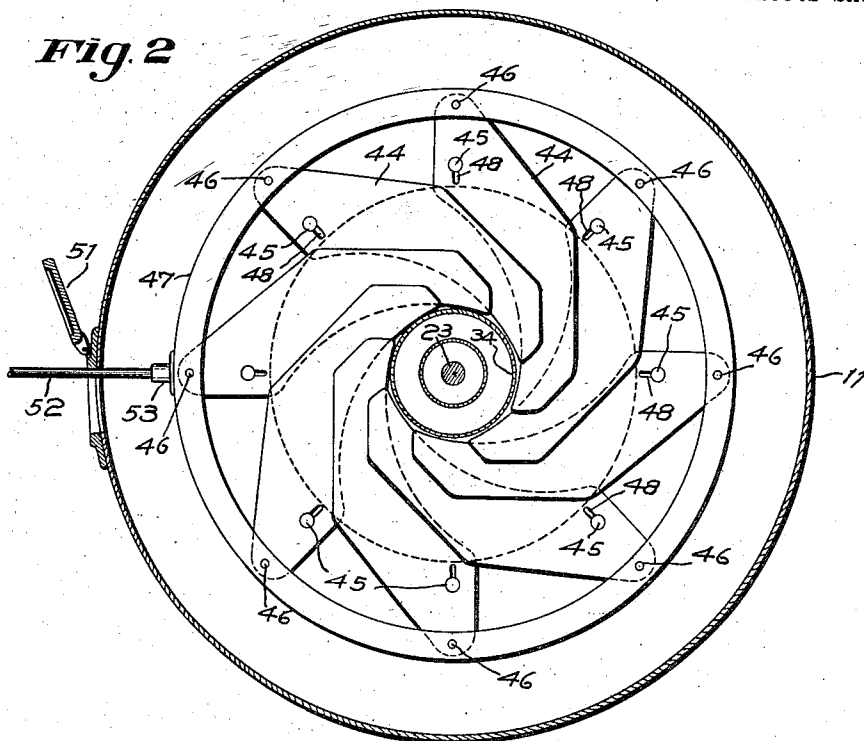
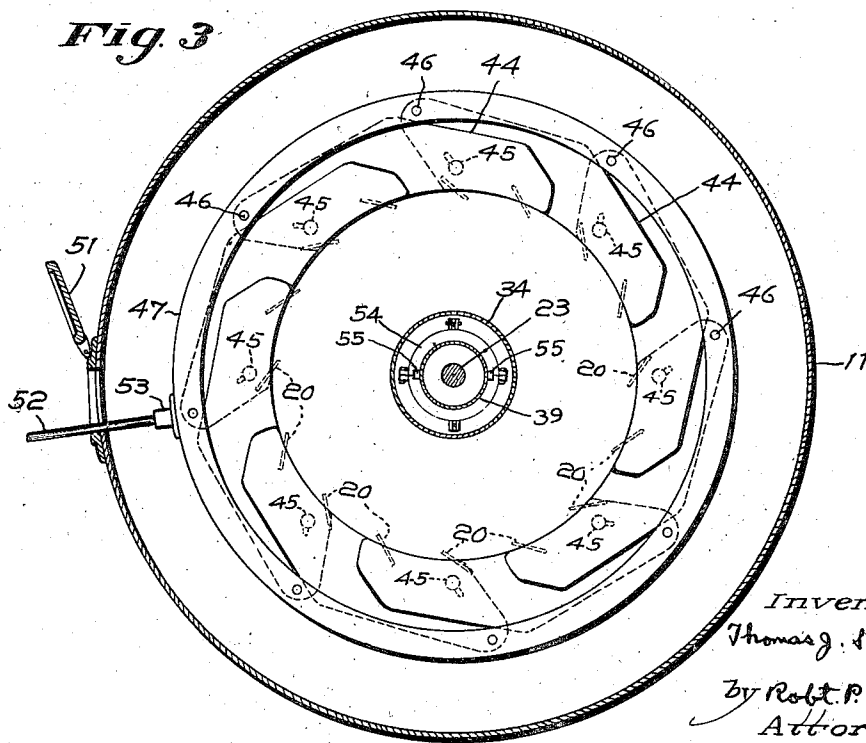


Fig. 3



Inventor:
Thomas J. Sturtevant
By Robt. P. Haines
Attorney

Oct. 16, 1923.

1,470,892

T. J. STURTEVANT

AIR SEPARATOR

Filed Aug. 26, 1921

3 Sheets-Sheet 3

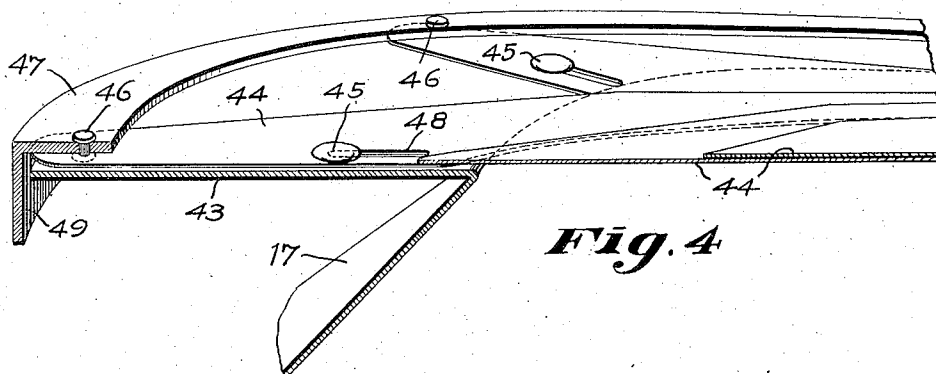


Fig. 4

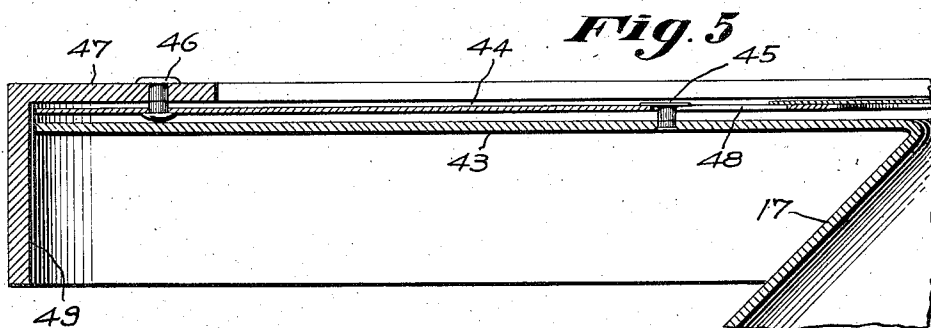


Fig. 5

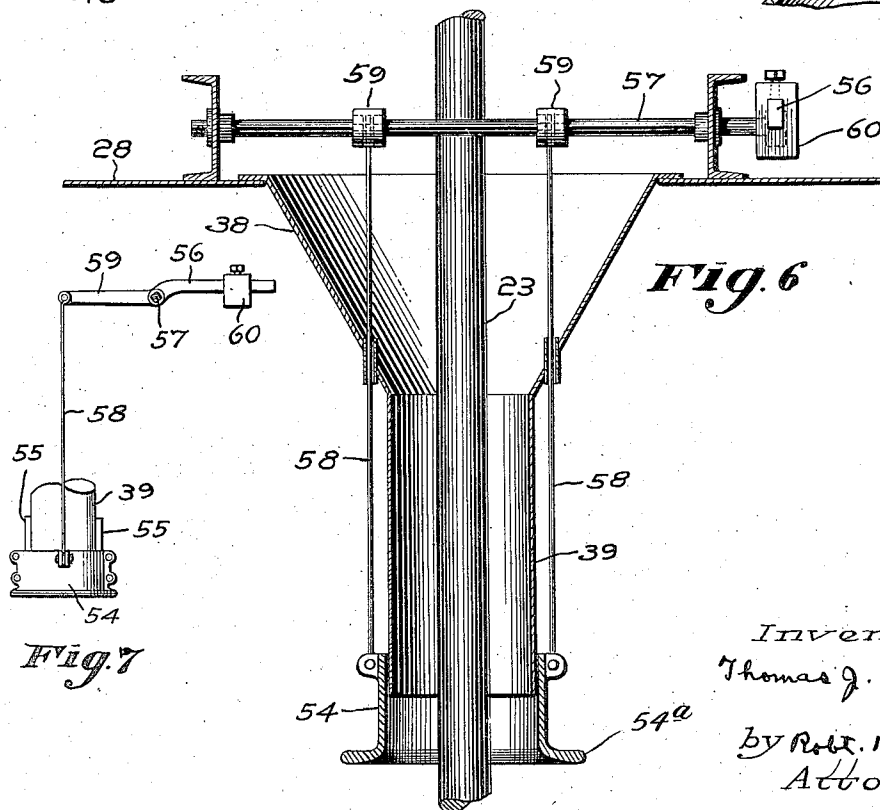


Fig. 6

Fig. 7

Inventor:
Thomas J. Sturtevant
by Robt. P. Haine
Attorney

UNITED STATES PATENT OFFICE.

THOMAS J. STURTEVANT, OF WELLESLEY, MASSACHUSETTS, ASSIGNOR TO STURTEVANT MILL COMPANY, OF BOSTON, MASSACHUSETTS, A CORPORATION OF MASSACHUSETTS.

AIR SEPARATOR.

Application filed August 26, 1921. Serial No. 495,706.

To all whom it may concern:

Be it known that I, THOMAS J. STURTEVANT, a citizen of the United States, residing at Wellesley, in the county of Norfolk and State of Massachusetts, have invented an Improvement in Air Separators, of which the following description, in connection with the accompanying drawings, is a specification, like characters on the drawings representing like parts.

The invention to be hereinafter described relates to air separators for grading materials.

A separator of this type usually comprises a separating chamber and a collecting chamber communicating through upper and lower openings, a fan for causing an air current to circulate through said chambers and openings so that the current rises in the separating chamber and descends in the collecting chamber. The materials to be graded are introduced into the path of the rising air current in the separating chamber. The smaller particles or fines are carried upward with the rising air current over into the collecting chamber and are delivered through an outlet, while the heavier particles or tailings gravitate downward in the rising current in the separating chamber and are delivered through another outlet.

A problem in these separators is to prevent the fines which flow down through the collecting chamber from returning with the air current into the separating chamber. One way of preventing this is to impart a whirling motion to the air descending in the collecting chamber so that the fines therein will be thrown outwardly by centrifugal force away from the opening leading into the separating chamber.

It has been proposed heretofore to provide adjustable vanes at the lower opening of the separating chamber in order that the passage of air from the collecting to the separating chambers may be controlled by adjusting these vanes. This is a good, practical construction for grading certain materials, but when materials are graded which are of light weight, and in which the difference in specific gravity between the fines and tailings is small, it is found that if the angles of the vanes are changed from a given position, local current will be produced adjacent these vanes that seriously

reduces the grading efficiency of the separator. It is also found that any disturbance of the whirling motion of the air in the collecting chamber reduces the grading efficiency of the separator.

An important feature of the present invention, therefore, consists in means adjustable to control the strength of the air current in the separator without disturbing the general whirling motion of the air in the collecting chamber.

Another important feature of the invention consists in means that is adjustable to deflect inwardly the air current rising in the separating chamber.

Another important feature of the invention consists in novel valve means for regulating the passage of air from one chamber to the other.

And still another feature of the invention consists of floating means for controlling the materials delivered to the distributor to be thrown out uniformly in all directions.

The above and other features of the invention and novel combination of parts will be herein described in connection with the accompanying drawings which show one good, practical form of the invention.

In the drawings:—

Figure 1 is a vertical sectional view through an air separator embodying the invention;

Fig. 2 is a sectional view taken on line 2—2 of Fig. 1, showing the adjustable vanes in the closed position;

Fig. 3 is a view similar to Fig. 2, but shows the adjustable vanes in the open position;

Fig. 4 is an enlarged perspective view of part of the separator having the adjustable vanes connected thereto;

Fig. 5 is a still further enlarged view of parts shown in Fig. 4;

Fig. 6 is a vertical sectional view of the feed tube and associated parts; and

Fig. 7 is a side view of parts shown in Fig. 6.

Referring to the drawings: The separator shown therein comprises an outer casing 10 consisting of an upper cylindrical portion 11 having a conical, downwardly-extending portion 12 secured thereto, and the outer casing is supported by suitable brackets or feet 13.

Within the outer casing 10 is mounted the

inner casing 14, in the present instance consisting of an intermediate cylindrical portion 15 with a downwardly-converging portion 16 and an upwardly-converging portion 17. Below the inner casing 14 is provided a downwardly-extending conical casing 18, supported within the conical casing 12 and in spaced relation thereto by the brackets 19. The inner casing 14 is supported by the casing 18 and in spaced relation thereto by the upstanding vanes 20.

In the type of separator to which the present invention relates, means is provided for producing an air current rising in the inner or separating chamber and descending in the outer or collecting chamber, and the materials to be separated are introduced into the path of the rising air current so that the coarse particles are carried downwardly by gravity within the inner casing while the finer particles, or fines, are carried upward by the rising air current into the outer or collecting chamber. Various constructions might be provided for producing the desired circulating air currents, and for introducing materials into the rising air current, and satisfactory means to this end will now be described.

Within the inner casing is mounted an upright shaft 23, the lower end of which is journaled in a bearing 24 supported from the casing 18 by the brackets 25 and the sleeve 26, and the upper end of the shaft is journaled in a bearing 27 supported above the cover plate 28 of the outer casing 10. The shaft 23 has the distributor 29 secured thereto to be rotated by the shaft. In the present instance, the distributor has a casting 30 rigidly secured to the shaft 23 and the casting carries a disk or plate 31, and above the plate 31 is provided a hood 32 supported in spaced relation to the casting 30 by the posts 33. Extending upwardly from the posts 33 is a sleeve shaft 34 which supports and drives the fan 35. The fan is positioned adjacent the upper end of the inner casing 14 and consists of vanes 36 secured to the sleeve shaft by spokes 37. About the shaft 23 is provided a feed hopper 38 supported by the cover 28, and to the hopper is secured a feed tube 39 that delivers the materials upon a plate 40 of the rotating distributor. From this plate the materials are thrown outwardly by centrifugal force into the path of the rising air current. As the materials are thrown outwardly over the surface of the plate 31, they wear the plate away. It is therefore desirable to protect the plate by providing the edge thereof with an upstanding rim 41 which forms a pocket as at 42, adapted to hold enough of the materials to protect the plate from wear.

As above pointed out, it is found that under certain separating conditions, adjust-

ment of the vanes adjacent the lower end of the separator casing to control the air current, produces local currents that disturb the operating conditions. In the present invention, the production of such currents is avoided by constructing the vanes 20 so that they serve to promote a whirling movement of the air in the lower portion of the outer chamber but do not serve to regulate the passage of air from the outer to the inner casing. To this end the vanes 20 are constructed so that they may be adjusted individually to the angle which is found to be best suited for the general working conditions, and may then be bolted or otherwise secured in the adjusted position. It will be apparent that a large amount of air passes from the outer chamber into the inner chamber between the vanes 20 as the air is forced downward in the outer chamber and sucked up through the inner chambers by the fan 35, and the angular disposition of the vanes 20 shown in Fig. 3 causes the air to pass between these vanes in approximately a tangential direction from the outer to the inner chamber, so that the air that is drawn inwardly between the angularly disposed vanes 20 exerts a whirling pull upon the air in the outer chamber.

The passage of air from the inner to the outer casing is controlled, in the present case, by valve means positioned adjacent the upper end of the inner casing 14. In the embodiment of the invention illustrated, the upper end of the inner casing 14 is provided with an outwardly-extending annular plate or flange 43. This flange lies in close proximity to the fan blades 36 and assists the fan in directing the whirling current outwardly toward the walls of the outer casing 10. Upon this flange is mounted the current regulating valve, consisting of vanes 44 which are adjustable inwardly toward the sleeve shaft 34 to vary the size of the opening at the upper end of the inner casing. The vanes 44 consist of flat, horizontally-extending plates or blades arranged in overlapping relation and are pivotally secured to the flange 43 by pivot pins 45 (see Figs. 2, 3, 4 and 5). The outer ends of the vanes 44 are pivotally secured at 46 to an adjustable ring 47 while the inner ends of the vanes overlap. The construction is such that when the ring 47 is rotated in one direction, the inner ends of the vanes 44 will be swung inwardly toward the sleeve shaft 34 as shown in Fig. 2, to reduce the size of the opening at the upper end of the inner casing, and when the ring 47 is adjusted in the opposite direction, the vanes will be swung outwardly away from the sleeve shaft 34, as shown in Fig. 3. The vanes are provided with elongated slots 48 that permit longitudinal movement of the vanes relative to the pins 45, and the adjusting ring 47

preferably has a downwardly-extending flange 49.

Separation of the tailings from the fines within the inner casing is promoted by constructing the inner casing so that the rising air current is deflected inwardly as it approaches the upper end of the casing, and to this end the casing 14 has the upwardly-converging walls 17.

The adjustable valve means at the upper end of the inner casing serves a double function, for, in addition to controlling the passage of air from the separating casing it serves also to vary the extent to which the air current may be deflected inwardly to promote the separating operation. This will be apparent from Fig. 1, in which the materials rising in the air current are indicated by 50 as deflected inwardly by the vanes 44.

In order that the ring 47 may be readily adjusted to change the adjustment of the vanes 44, a door 51 is provided in a wall of the outer casing through which a tool or bar 52 may be inserted into a socket 53 secured to the ring 47, and then operated to adjust the ring.

The materials to be separated may be readily delivered to the hopper 38 at any predetermined rate of speed by means, not shown and in this way the rate at which materials are delivered to the interior of the separator may be controlled. But in most cases the material will slide down one side of the hopper 38 and fall upon the plate 40 without being evenly distributed around the plate and as a result the materials will not be thrown outwardly evenly in all directions. To avoid this a floating sleeve 54 is provided having a relatively flat flange 54^a at its lower end that rests upon the plate 40 of this distributor, or upon a layer of materials upon this plate. The sleeve 54 preferably surrounds the tube 39 and is slidably secured thereto by keys 55 upon the tube. As a result of this construction the sleeve 54 will be held against rotation and will rest floatingly upon the materials that are rotated by the plate 40. This will cause the materials to be spread out evenly over the plate 40 and to be thrown outwardly uniformly in all directions by the distributor. Since the sleeve 54 rests upon and is supported by the materials upon the plate 40 it will serve to spread the materials out evenly over the plate irrespective of the speed at which the materials may be delivered thereto, and if a lump or large particle falls upon the plate 40 it will work under the flange 54^a and escape therefrom. The sleeve 54 preferably is counterbalanced by a weighted lever 56 secured to a rocking shaft 57, and this shaft is connected to the sleeve by rods 58 having their lower ends secured to the sleeve and their upper ends

connected to the outer ends of levers 59 secured to the shaft 57. The arrangement is such that by adjusting the weight 60 along the lever 56 the sleeve will be made to rest as lightly upon the materials as desired.

The upright shaft 23 may be driven from a pulley 61 by a shaft 62, and gears 63 and 64, and these gears are preferably enclosed in a casing 65. Within the lower portion of the inner casing 14 a cone-shaped deflector 66 is preferably provided to deflect the air current outwardly as it rises, and this deflector may be supported by the sleeve 26.

From the foregoing description when read in connection with the drawings, it will be seen that the valve at the upper end of the separating casing may be readily adjusted to vary the strength of the air current, and that adjustment of this valve will not produce disturbing local or eddy currents within the outer casing.

It will be understood that the invention is not limited to the specific embodiment shown, and that various deviations may be made therefrom without departing from the spirit and scope of the appended claims.

What is claimed is:—

1. An air separator comprising, in combination, outer and inner casings having openings between them, an upright shaft projecting into the inner casing and having driving means at its upper end, a rotary distributor mounted on said shaft, a fixed feed tube surrounding said shaft and adapted to deliver materials to the distributor, a sleeve shaft mounted on the rotary distributor, a fan supported and rotated by said sleeve shaft for inducing an air current through said casings, valve means adjacent the fan for regulating the flow of air from one casing to the other, and whirl-producing means at the opening through which the air enters the inner casing.

2. An air separator comprising, in combination, outer and inner casings having openings between them, an upright shaft within the inner casing and having driving means at its upper end, a rotary distributor within said inner casing and driven by said shaft, a fixed feed tube surrounding said shaft and extending into the inner casing for delivering materials to the distributor, a sleeve shaft extending upwardly around the feed tube a substantial distance and rotated by the upright shaft, and a fan secured to the upper end of the sleeve shaft and rotated thereby to produce air currents passing up in the inner casing and down in the outer casing.

3. An air separator comprising, in combination, outer and inner casings having openings between them, an upright shaft within the inner casing and having driving means at its upper end, a rotary distributor within said inner casing and driven by said shaft,

a fixed feed tube surrounding said shaft and extending into the inner casing for delivering materials to the distributor, a sleeve shaft extending upwardly around the feed tube a substantial distance and rotated by the upright shaft, a fan secured to the upper end of the sleeve shaft and rotated thereby to produce air currents passing up in the inner casing and down in the outer casing, and valve means surrounding the sleeve shaft adjacent the fan and adjustable toward and from the sleeve shaft to regulate the flow of air from one casing to the other.

4. An air separator comprising, in combination, outer and inner casings having openings between them at the ends of the inner casing, an upright shaft within the inner casing and having means for rotating the same, a rotary distributor operatively secured to the shaft within the inner casing, a tube for delivering materials to be graded to the rotary distributor, a fan at the upper end of the inner casing and operated by said shaft to produce air currents rising in the inner casing and passing downwardly in the outer casing with a spirally whirling movement, angularly disposed vanes at the lower end of the inner casing in the communication between the casings and arranged further to promote whirling movement of the air in the outer casings by causing the air to travel in approximately a tangential direction from the outer to the inner chamber, and valve means between the inner casing and fan and adjustable to vary the size of the air opening at the upper end of the inner casing.

5. An air separator comprising, in combination, an outer casing, an inner casing having open ends and inwardly converging walls at its upper end portion, an upright shaft within the inner casing and having means for rotating the same, a rotary distributor operatively secured to the shaft within the inner casing, means for delivering materials to be graded to the rotary distributor, a fan at the upper end of the inner casing and operated by said shaft to produce air currents rising in the inner casing and passing downwardly in the outer casing with a spirally whirling movement, angularly disposed vanes at the lower end of the inner casing in the communication between the casings and arranged further to promote whirling movement of the air in

the outer casing by causing the air to travel in approximately a tangential direction from the outer to the inner chamber, and valve means between the inner casing and fan and adjustable inwardly from the upper end of said converging walls to vary the size of the air opening at the upper end of the inner casing.

6. An air separator comprising, in combination, outer and inner casings having openings between them, an upright shaft within the inner casing and having driving means at its upper end, a rotary distributor within said inner casing and driven by said shaft, a fixed feed tube surrounding said shaft and extending into the inner casing for delivering materials to the distributor, a sleeve shaft extending upwardly around the feed tube a substantial distance and secured to the distributor for rotation therewith, a fan secured to the upper end of the sleeve shaft and rotated thereby to produce air currents passing up in the inner casing and down in the outer casing, and a floating sleeve slidably mounted within the space between the fixed feed tube and the sleeve shaft and having a wide lower face that rests on the materials upon the distributor to spread them out as they are rotated under the sleeve by the distributor.

7. An air separator comprising, in combination, outer and inner casings having openings between them at the ends of the inner casing, means for producing air currents rising in the inner casing and passing downwardly in the outer casing, a shaft within the inner casing and having means for rotating the same, a rotary distributor operatively secured to the shaft within the inner casing and having a plate upon which the materials to be distributed are delivered, a feed tube for delivering materials upon said plate, a floating sleeve mounted to rest floatingly upon said plate or the materials thereupon and having a wide lower face that rests upon the materials and spreads them out as they are rotated under the sleeve face by the distributor, and counter-balancing means for lifting the sleeve bodily as the materials increase under the same.

In testimony whereof, I have signed my name to this specification.

THOMAS J. STURTEVANT.