

Aug. 7, 1934.

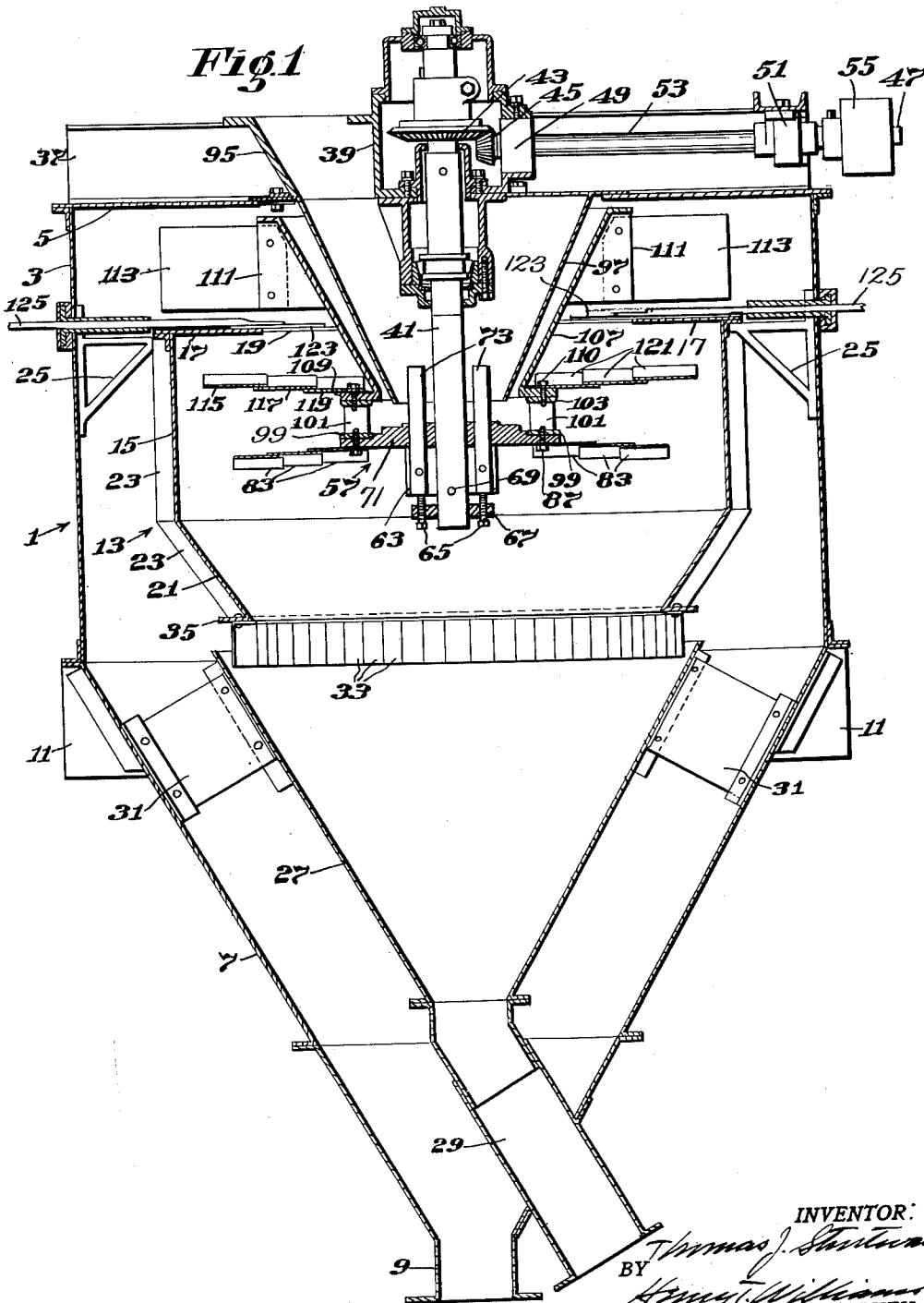
T. J. STURTEVANT

1,968,862

AIR SEPARATOR

Filed April 2, 1930

2 Sheets-Sheet 1



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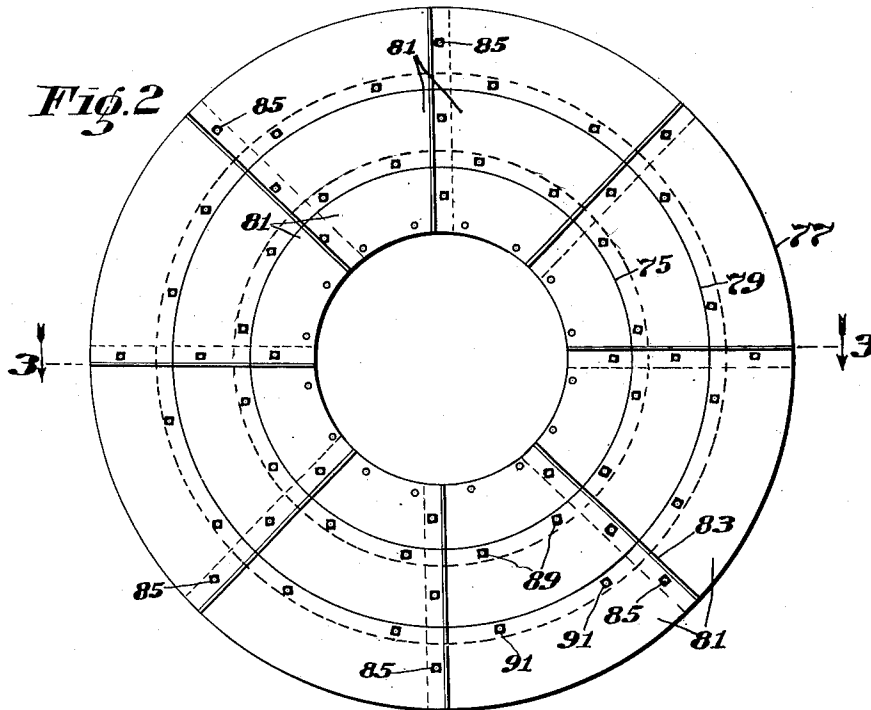
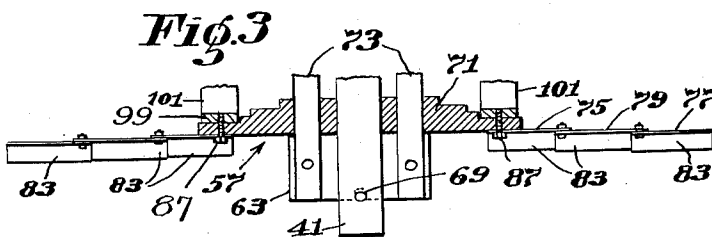
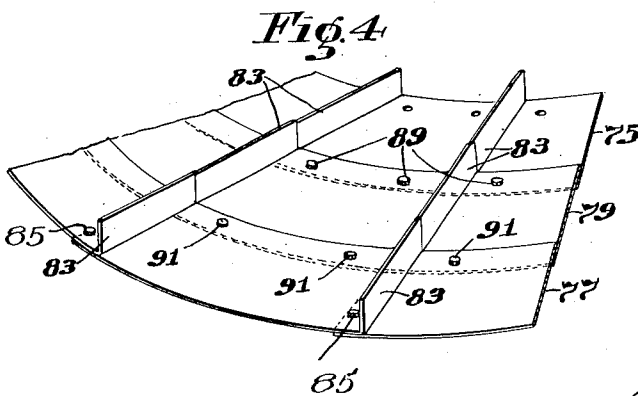
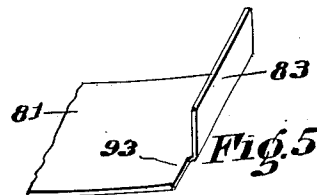
T. J. STURTEVANT

1,968,862

AIR SEPARATOR

Filed April 2, 1930

2 Sheets-Sheet 2



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1,968,862

AIR SEPARATOR

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Application April 2, 1930, Serial No. 441,071

13 Claims. (Cl. 209—139)

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

The invention is embodied in a separator of the type wherein the separation is accomplished by a whirling air current moving upward in a separating chamber and downward in a settling chamber. The air is induced by a fan and caused to circulate through the chambers, and in its course it passes through a space between the upper and lower shells forming the casing of the separating chamber, and through a discharge opening at the top of the separating chamber. The materials to be graded are fed into the separating chamber and are received by a rotary distributor which throws the materials out across the rising air current under the influence of centrifugal force. The fines or lighter particles are carried upward by the air current through the discharge outlet of the separating chamber and pass over into the settling chamber where they gravitate downward and are delivered therefrom, while the heavier particles gravitate down through the air current in the separating chamber and are delivered therefrom.

The rotary distributor comprises upper and lower spaced plates. The materials are delivered to the lower plate centrally thereof, and are thrown outward into the air current which is whirling and rising. The lighter particles are caught by the air current and lifted and discharged through the opening at the top of the separating chamber. The heavier particles, on the other hand, slide outward along the lower plate of the distributor, and strike the inner surface of the upper shell of the separating chamber. Under certain conditions it is found that heavier particles will strike the shell with an angle of incidence such that on rebounding therefrom they are directed upward and carried over into the settling chamber. The greater the diameter of the lower distributor plate, the greater will be the centrifugal force on the heavier particles leaving said plate, and therefore the greater will be the velocity of the particles thrown against the shell. It follows that with high velocities the heavier particles will rebound swiftly from the shell, and if this rebound is in an upward direction, there will be greater liability of the heavier particles being carried out with the fines than if the heavier particles are moving at lower velocities. By reducing the diameter of the lower distributor plate, the centrifugal effect is diminished and the adjustment may be such that the particles thrown against the shell will have an angle of incidence causing the particles to re-

bound from the shell downward and be discharged therefrom. A purpose of the present invention, therefore, is to provide a distributor which can be readily arranged according to the conditions and character of materials to be separated to prevent heavier particles striking the shell from rebounding upwardly toward the discharge opening of the separating chamber.

The larger the discharge opening of the separating chamber, the greater will be the capacity of the separator in grading materials, but the larger the opening, the greater will be the liability of coarser particles being carried from the separating chamber over into the settling chamber. Another purpose of the invention, therefore, is to provide the distributor with an upper plate which will have a diameter greater than that of the discharge outlet, so that the particles will be obliged to pass in a longer path and the lighter of the heavier particles will have greater opportunity to gravitate downward in the rising air current and avoid being carried out with the fines.

The character of the invention may be best understood by reference to the following description of one good form thereof shown in the accompanying drawings, wherein:

Fig. 1 is a view, in vertical section, through the separator;

Fig. 2 is a view looking toward the bottom of the lower distributor plate rings;

Fig. 3 is a view, in vertical section, taken on line 3—3 of Fig. 2;

Fig. 4 on an enlarged scale is a perspective view of a portion of the lower distributor plate looking toward the bottom thereof; and

Fig. 5 is a detail to be referred to.

Referring to the drawings, the separator shown therein as one good form of the invention, comprises an outer casing 1 (Fig. 1) consisting of a drum 3 having a head 5 at the upper end thereof and a cone 7 at the lower end thereof terminating in a discharge spout 9. The outer casing is provided with brackets 11 adapted to rest upon and be secured to suitable supporting means.

Within and spaced from the outer casing is an inner casing 13 consisting of a drum or shell 15 having a head 17 at the upper end thereof with a discharge opening 19. Projecting down from the drum 15 is a conical shell 21. The drum and shell are provided with angle stiffening ribs 23. The drum 15 is carried by brackets 25 secured to the drum of the outer casing. Beneath and spaced from the shell 21 is a lower conical shell 27 having a discharge spout 29 which extends through an

opening in the cone 7 of the outer casing. The lower shell 27 is carried by webs 31 secured to angle bars on the cones 7 and 27.

The space between the upper and lower shells 5 of the inner casing serves as an inlet for the passage of air current from the settling chamber into the separating chamber. In this space are a series of laterally overlapping vanes 33 pivotally connected to a ring 35 and depending therefrom. 10 These vanes may be constructed and arranged substantially the same as in my United States Patent No. 1,769,721 dated July 1, 1930.

At the top of the separator are channels 37 supporting a housing 39 in which is journaled a vertical shaft 41. Fast on said shaft is a bevelled gear 43 meshing with a bevelled pinion 45 on a horizontal shaft 47 journaled in bearing boxes 49 and 51 and extending through a tube 53 connected to said bearing boxes, said shaft being provided with a driving pulley 55.

Mounted on the shaft adjacent the lower end thereof is a rotary distributor 57 comprising a lower or feed plate and an upper or baffle plate spaced therefrom. The lower plate has a hub 63 resting on jack screws 65 threaded in a ring 67 connected to the shaft. The hub is caused to rotate with the shaft by a pin 69 extending through the shaft and notches in the hub. Mounted on the hub is a stepped disk 71, and projecting up from the hub through this disk are stirrer blades 73.

As stated, one of the purposes of the invention is to provide a lower plate which may be adjustable to vary the diameter thereof. To accomplish this, rings are provided encircling the disk, and detachably connected thereto and detachably connected to one another. In the present instance (see Figs. 2 to 4), an inner ring 75, an outer ring 77, and an intermediate ring 79 are provided. 35 The rings are formed of segments 81, each having at an end thereof an outstanding transverse flange 83 (see Fig. 5) serving as a stiffening rib. The segments of each ring have overlapping margins detachably connected by bolts 85. The corresponding flanges of the inner, outer and intermediate rings are in alinement, so that in general appearance ribs are provided extending radially from the central disk to the periphery of the outer ring.

The inner ring 75 overlaps the disk, and is detachably connected thereto by bolts 87 (Fig. 3). The intermediate ring 79 overlaps the inner ring and is detachably connected thereto by bolts 89, and the outer ring 77 overlaps the intermediate ring and is detachably connected thereto by bolts 91. The stiffening flanges have notches 93 (Fig. 5) therein enabling overlapping of the rings and positioning of the flanges in alinement.

The construction is such that the diameter of the lower distributor plate may be readily varied according to conditions as required. Assembly of the three rings with the disk furnishes one diameter, removal of the outer ring another, removal of the intermediate ring another, and removal of the inner ring still another diameter. Formation of the rings in segments facilitates their removal. The materials to be graded are introduced into the separator to the distributor through an upper hopper 95 communicating with a lower hopper 97 carried by the head of the outer casing.

Mounted on the disk 71 of the lower distributor plate is a lower ring 99 having posts 101 projecting up therefrom at intervals to an upper ring 103, said rings and posts being preferably formed 75 of one casting. The lower ring is secured to the

disk by the screw bolts 87 referred to which are entered through holes in the disk and threaded to the lower ring.

The fan for developing the whirling air current comprises a conical shell hub 107 having an outstanding flange 109 mounted on the upper ring 103 and secured thereto by screw bolts 110 entered through holes in the flange and threaded to the upper ring. Projecting from the hub are plates 111 to which the fan blades 113 are secured. 80 85

Under certain conditions it is desirable that the baffle formed by the upper distributor plate shall be adjustable to vary the diameter thereof. To accomplish this, it may be formed of an outer ring 115, an inner ring 117, and an intermediate ring 119. The inner ring may be secured to the upper ring 103 referred to, by the screw bolts 110 which attach the fan hub flange thereto. Each of these rings may be formed of segments and have upstanding transverse flanges 121 serving as stiffening ribs. As illustrated each annular ring of the baffle plate is formed of an equal number of segments and preferably, although not necessarily, the rings are so connected that the corresponding flanges 121 are aligned radially at the upper side of the plate. The flanges are of substantial depth and constitute, with respect to each ring, a circular series of blades functioning to increase the whirl of the air in the separating chamber. The segments of each ring may have overlapping margins detachably connected, and the rings themselves may be detachably connected. Since the construction of the rings of the upper plate is similar to the construction of the rings of the lower plate, it is unnecessary to show the same more in detail than as in Fig. 1 herein. 90 95 100 105 110

The construction is such that the diameter of the baffle plate may be readily varied according to conditions as required. Assembly of the three rings furnishes one diameter, removal of the outer ring another, removal of the intermediate ring another, and removal of the inner ring still another diameter. When a ring is detached to decrease the size of the baffle plate the corresponding series of blades is removed with it thus proportionately decreasing the blade area to accord with the then smaller baffle. 115 120

To vary the size of the discharge opening 19 in the head of the separating chamber, a valve may be provided comprising a series of overlapped plates 123 secured to radial bars 125 which extend through and beyond the outer casing where they are accessible for convenient adjustment of the blades. This valve may be similar to that disclosed in Letters Patent No. 1,615,558, granted to me January 25, 1927, and therefore, it is unnecessary to show and describe the same in detail herein. 125 130

For maximum capacity in grading materials, the valve is adjusted to provide the greatest discharge opening. The diameter of the upper distributor plate is greater than this maximum opening to contribute to preventing lighter of the heavier particles from escaping through said opening. When a ring or rings of the upper distributor plate are removed to reduce the diameter thereof, the valve for the discharge opening of the separating chamber may be adjusted so that the effective opening will be less than the diameter of the upper distributor plate. 135 140 145

In operation, the material to be graded is fed through the hoppers to the lower plate of the rotary distributor, and is thrown outward thereby under the influence of centrifugal force into the path of the air current whirling and rising in 150

the separating chamber. The finer particles will be caught and carried by the air out past the upper distributor plate, thence inward and through the discharge outlet of the separating chamber. The finer particles pass through the fan chamber into the settling chamber and are discharged through the spout 9. The heavier particles will gravitate downward through the air current whirling and rising in the separating chamber, and be delivered through the spout 29.

Under certain conditions it is desirable that the upper plate of the distributor shall not only be larger than the discharge opening of the separating chamber, but also larger than the lower plate of the distributor as shown herein.

The size of the lower distributor plate should be such that heavier particles thrown outward against the upper shell of the separating chamber will strike the same with an angle of incidence such that they will rebound downward and not be carried upward with the fines through the discharge outlet of the separating chamber. It will be understood that the particles are subjected to a number of forces including the centrifugal force which throws them against the shell, the frictional force due to rotation of the distributor, the force of the whirling and rising air current, and the force of gravity. The adjustment and construction should be such that the resultant force and effect will be to cause the coarser particles to move downward in the separating chamber and be discharged therefrom.

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 for grading materials comprising, in combination, outer and inner casings, a separating chamber in the inner casing, a settling chamber between said casings, a fan for causing air to whirl and circulate through said chambers, and a rotary distributor in the separating chamber for receiving materials and delivering the same into the path of the air current, said distributor comprising upper and lower spaced plates, the upper plate consisting of a plurality of annular rings each formed of a plurality of segments said segments being detachably connected so that the size of the plate may be varied.

2. An air separator for grading materials comprising, in combination, outer and inner casings, a separating chamber in the inner casing, a settling chamber between said casings, a fan for causing air to whirl and circulate through said chambers, and a rotary distributor in the separating chamber for receiving materials and delivering the same into the path of the air current, said distributor comprising upper and lower spaced plates, the lower plate consisting of a plurality of annular rings each formed of a plurality of segments said segments being detachably connected so that the size of the plate may be varied.

3. An air separator for grading materials comprising, in combination, outer and inner casings, a separating chamber in the inner casing, a settling chamber between said casings, a fan for causing air to whirl and circulate through said chambers, and a rotary distributor in the separating chamber for receiving materials and delivering the same into the path of the air current,

said distributor comprising upper and lower spaced plates, the lower plate comprising a plurality of flat rings differing in size and detachably connected so that one or more of the rings may be removed to reduce the diameter of the plate.

4. An air separator for grading materials comprising, in combination, outer and inner casings, a separating chamber in the inner casing, a settling chamber between said casings, a fan for causing air to whirl and circulate through said chambers, and a rotary distributor in the separating chamber for receiving materials and delivering the same into the path of the air current, said distributor comprising upper and lower spaced plates, the lower plate comprising a plurality of concentric rings each having transverse stiffening ribs, said rings being detachably connected so that one or more of the rings may be removed to reduce the diameter of the plate.

5. An air separator for grading materials comprising, in combination, outer and inner casings, a separating chamber in the inner casing, a settling chamber between said casings, a fan for causing air to whirl and circulate through said chambers, and a rotary distributor in the separating chamber for receiving materials and delivering the same into the path of the air current, said distributor comprising upper and lower spaced plates, the lower plate comprising a central disk and a plurality of annular rings differing in size encircling the disk and detachably connected to the disk and to one another so that one or more of the rings may be removed to reduce the diameter of the plate.

6. An air separator for grading materials comprising, in combination, outer and inner casings, a separating chamber in the inner casing, a settling chamber between said casings, a fan for causing air to whirl and circulate through said chambers, and a rotary distributor in the separating chamber for receiving materials and delivering the same into the path of the air current, said distributor comprising upper and lower spaced plates, the upper plate comprising a plurality of flat rings differing in size and detachably connected so that one or more of the rings may be removed to reduce the diameter of the plate.

7. An air separator for grading materials comprising, in combination, outer and inner casings, a separating chamber in the inner casing, a settling chamber between said casings, a fan for causing air to whirl and circulate through said chambers, and a rotary distributor in the separating chamber for receiving materials and delivering the same into the path of the air current, said distributor comprising upper and lower spaced plates, the upper plate comprising a plurality of concentric rings each having transverse stiffening ribs, said rings being detachably connected so that one or more of the rings may be removed to reduce the diameter of the plate.

8. An air separator comprising, in combination, outer and inner casings, a separating chamber in the inner casing, a settling chamber between said casings, a fan for causing air to whirl and circulate through said chambers, and a rotary distributor in the separating chamber for receiving materials and delivering the same into the path of the air current, said distributor comprising upper and lower spaced plates, the lower plate comprising a plurality of annular rings one of which is formed of a plurality of segments said segments being detachably connected

nected so that the size of the plate may be varied.

9. In an air separator of the type described having separating and settling chambers, a rotary distributor within the separating chamber consisting of a lower feed plate and an upper baffle plate, said baffle plate comprising a plurality of annular rings one of which is formed of a plurality of segments said segments being detachably connected so that the size of the plate may be varied.
10. In an air separator of the type described having separating and settling chambers, a rotary distributor within the separating chamber consisting of a lower feed plate and an upper baffle plate, each plate comprising a plurality of annular rings one of which is formed of a plurality of segments said segments being detachably connected so that the size of the plate may be varied.
11. In an air separator of the type described having separating and settling chambers, a rotary distributor within the separating chamber consisting of a lower feed plate and an upper baffle plate, said baffle plate comprising a plurality of annular rings detachably connected to each other, the outer ring at least being formed

of a plurality of connected segments and each segment having an upstanding blade at its upper side to increase the whirl of the air in the separating chamber.

12. In an air separator of the type described having separating and settling chambers, a rotary distributor within the separating chamber consisting of a lower feed plate and an upper baffle plate, said baffle plate comprising a plurality of annular rings each formed of connected segments and each ring carrying whirl inducing blades at its upper side, said rings with the blades carried thereby being detachably connected to each other so that the size of the plate may be varied.

13. In an air separator of the type described having separating and settling chambers, a rotary distributor within the separating chamber consisting of a lower feed plate and an upper baffle plate, said baffle plate comprising a plurality of detachably connected annular rings, the several rings each having a separate circular series of upstanding blades at its upper side to increase the whirl of the air in the separating chamber.

THOMAS J. STURTEVANT.

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