Feb. 2, 1937. J. J. WALLACE 2,069,398

ROTARY BEATER AND PNEUMATIC SEPARATOR

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FIG. 1.

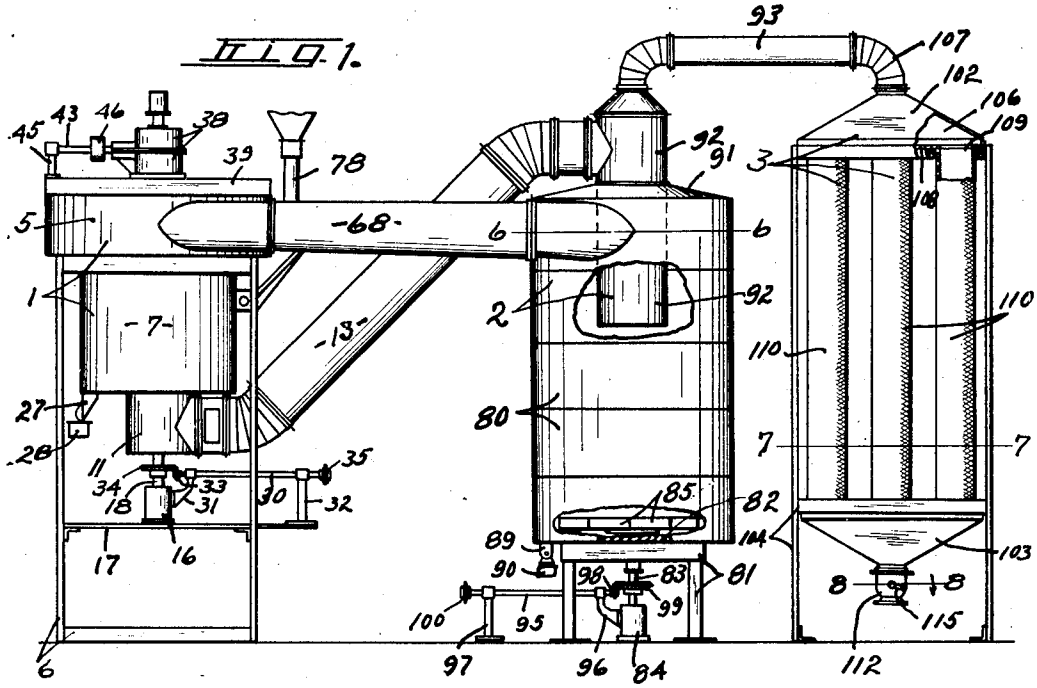
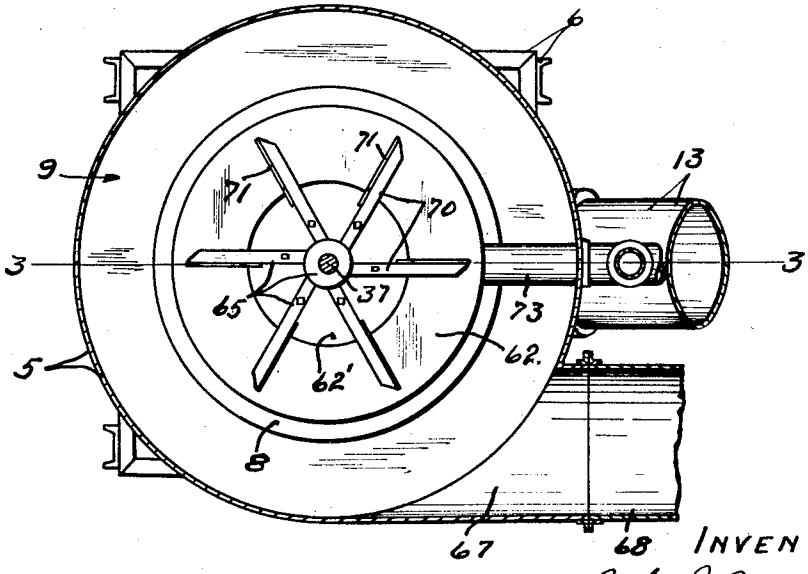


FIG. 2.



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FIG. 3.

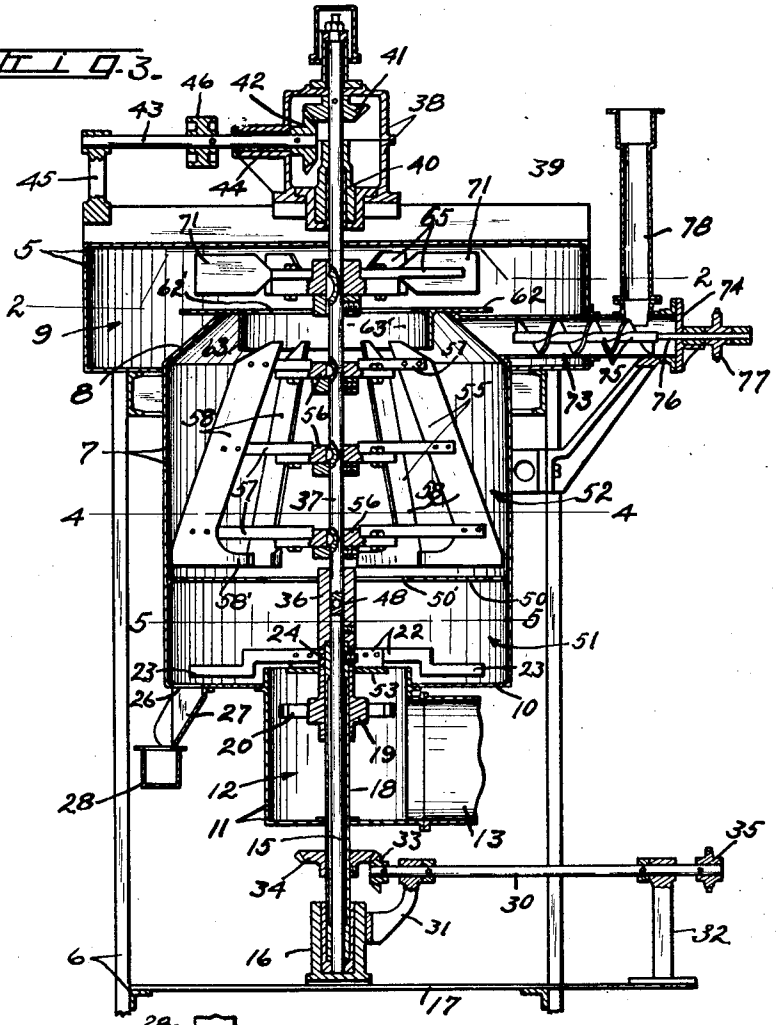
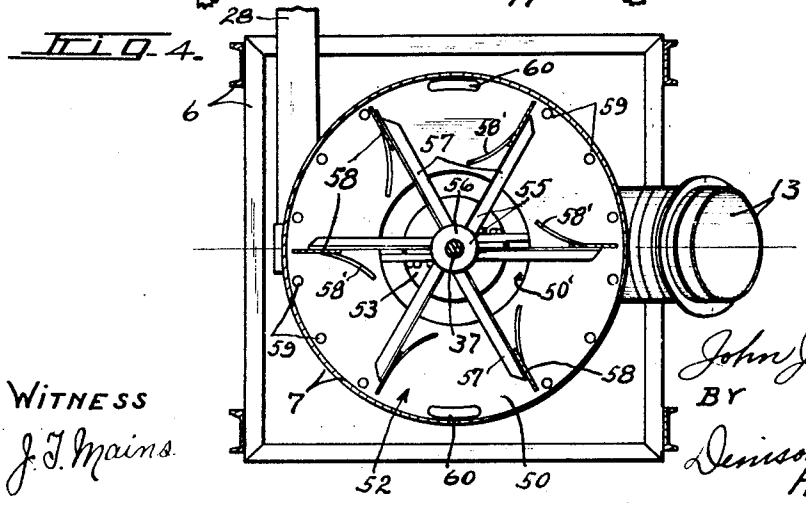


FIG. 4.



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Filed Jan. 11, 1933 4 Sheets-Sheet 3

FIG. 5.

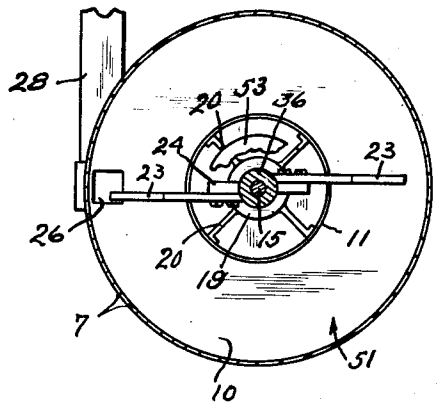


FIG. 6.

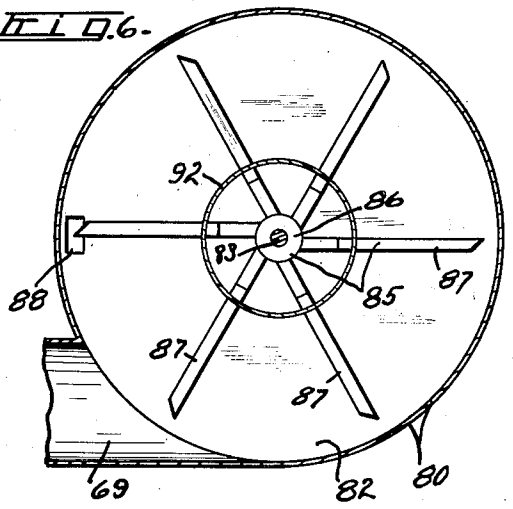


FIG. 7.

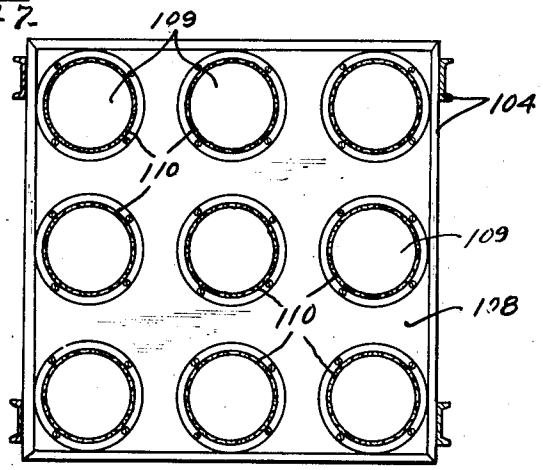


FIG. 8.

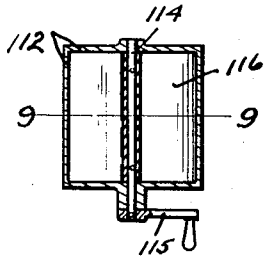
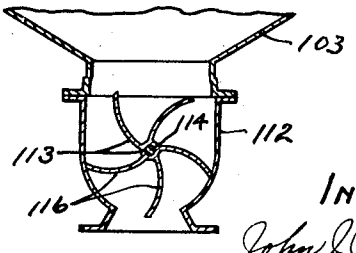


FIG. 9.



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FIG. 10.

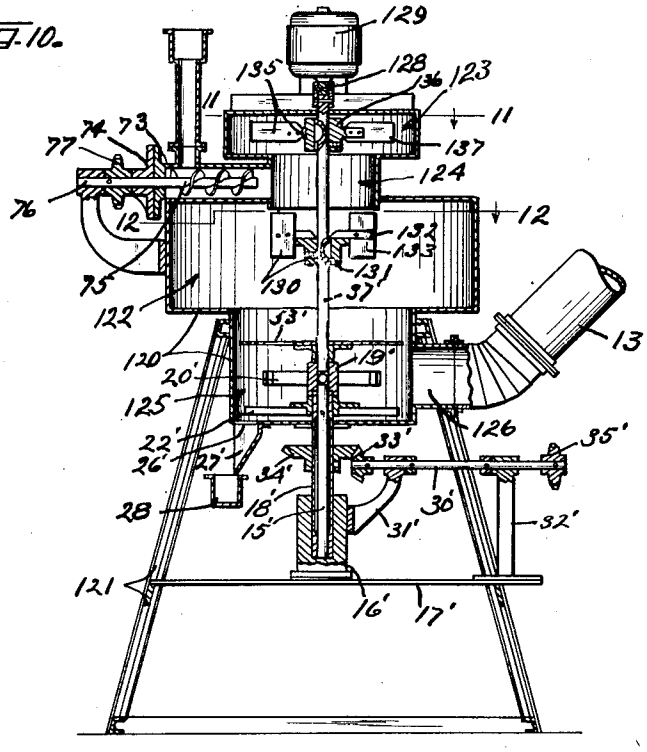


FIG. 11.

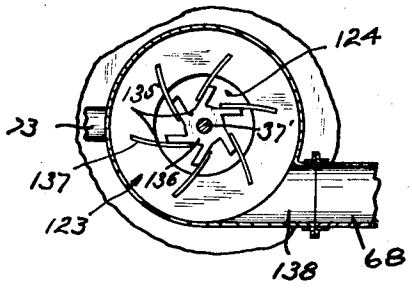
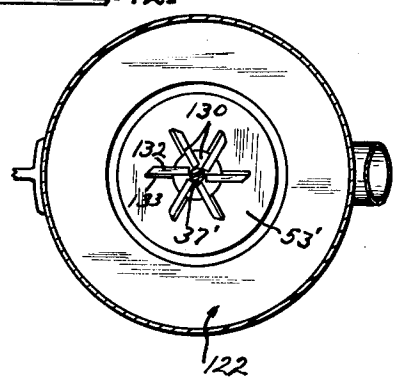


FIG. 12.



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UNITED STATES PATENT OFFICE

2,069,398

ROTARY BEATER AND PNEUMATIC SEPARATOR

John J. Wallace, Gouverneur, N. Y.

Application January 11, 1933, Serial No. 651,137

9 Claims. (Cl. 83—11)

This invention relates to new and useful improvements in pneumatic separators for use in connection with grinding mills of various types and which is adapted more particularly to separate foreign matter from light, fine, fibrous or non-fibrous materials such, for instance, as talc, asbestine or the like.

In the process of preparing certain material such as talc for use, the material, as received from the mine, is first passed through a grinding apparatus such as cylinder or tube mills, after which the ground material is passed through a separator for the purpose of removing the coarser particles of the material and any foreign materials such as silica sand which may be contained in the ground talc. After this ground material has been passed through conventional separators now in general use, there is approximately ninety per cent of the material in the proper degree of fineness to be useable in the manufacture of other articles, such as paper, paint, etc. This means that about ten per cent of the ground talc has to be again passed through the grinding mills where, at the most, only a small per cent of the re-ground talc is rendered fine enough to meet the requirements.

The main object of this invention is to produce an improved separator which will not only be very efficient in removing foreign materials from talc, asbestine or similar materials, but which will, at the same time, pulverize such materials during the separating process to such an extent that a much larger percentage of the ground materials will be available for use in the manufacture of other articles and thereby effect a saving in material at a minimum of expense.

Another object is to product a machine of the above-mentioned class which is compact, durable and economical in construction and which is simple and easy to operate.

In carrying out the above-mentioned objects, I have produced a separator, preferably having a separator fan or beater in the separating chamber, arranged below the material inlet to the chamber in such a manner that the heavier and coarser particles of the material being treated will necessarily come into contact with the separator fan or beater as they gravitate downwardly past the fan toward the lower end of the separating chamber. These relatively coarse particles are thus acted upon by the fan and broken up or pulverized to such an extent that instead of ninety per cent of the material being of the required degree of fineness as it comes from the separator, as is the case when using the conventional separators now on the market, as high as ninety-nine and a half per cent of the material leaving the separator is of the required degree of fineness to be suitable for use in the manufacture of various articles for which the material is adapted.

A further object is to produce an apparatus of the above-mentioned class that is particularly adapted to operate in conjunction with a dust collecting apparatus.

Other objects and advantages relating to the details of the structure of the separator and dust collector, and the form and relation of the parts thereof, will more fully appear from the following description, taken in connection with the accompanying drawings, in which:—

Figure 1 is a side view of an apparatus embodying the various features of this invention, with certain portions broken away to more clearly disclose the inner construction thereof.

Figure 2 is a horizontal sectional view of the upper end of my novel separator, taken in the plane of the line 2—2, Figure 3.

Figure 3 is a vertical central sectional view of my separator taken in the plane of the line 3—3, Figure 2.

Figure 4 is a horizontal sectional view through the separator chamber taken on the line 4—4, Figure 3.

Figure 5 is a horizontal sectional view taken on line 5—5, Figure 3.

Figure 6 is an enlarged horizontal sectional view taken through the inlet opening of an auxiliary separator which I use in connection with my novel separator taken substantially on the line 6—6, Figure 1.

Figure 7 is a horizontal sectional view taken through the intermediate portion of a dust collector which I also use in connection with my novel separator and taken substantially in the plane of the line 7—7, Figure 1.

Figure 8 is a detail horizontal sectional view through the outlet valve for the dust collector taken in the plane of the line 8—8, Figure 1.

Figure 9 is a vertical sectional view taken in the plane of the line 9—9, Figure 8.

Figure 10 is a central vertical sectional view similar to Figure 3, illustrating a modified form of my novel separator.

Figures 11 and 12 are detail horizontal sectional views taken respectively on lines 11—11 and 12—12, Figure 10.

In Figures 1 to 9 inclusive of the drawings, I have illustrated the preferred embodiment of my invention, which consists of my novel separator

and pulverizer 1, an auxiliary separator 2 and a dust collector 3, all of which may be arranged in any convenient spaced relation and connected by suitable pipes or conduits, as illustrated more clearly in Figure 1 and which will hereinafter be more fully described.

The separator 1 consists of a relatively flat cylindrical housing 5 mounted upon the upper end of a substantially rectangular frame 6. The housing 5 has secured to the bottom wall thereof, a pendant cylindrical case 7 which has the upper end thereof provided with a conical-shaped cap 8 which extends upwardly into the chamber 9 within the housing 5. The lower end of the case 7 is closed by a wall 10 which has centrally secured thereto, a pendant cylindrical wall 11 which forms an inlet chamber 12 in communication with the interior of the case 7 and which has secured to one side thereof, an inlet pipe or conduit 13 adapted to admit air to the chamber 12 and interior of the case 7.

A vertically disposed supporting shaft 15 extends upwardly through the chamber 12 into the lower end of the cylindrical case 7. The lower end of the shaft 15 is mounted in a bearing member 16 secured to a horizontal cross bar 17 provided on the frame 6 a short distance below the wall 11. Rotatably mounted upon the supporting shaft 15 is a tubular shaft 18 which has the lower end thereof journaled in the bearing member 16 and extends upwardly through the bottom wall of the chamber 12 into said chamber, with the upper end thereof journaled in a bearing member 19 centrally secured in the chamber 12 by means of arms 20 which have the outer ends thereof secured to the adjacent portion of the wall 11.

The upper end of the tubular shaft 18 extends a short distance above the chamber 12 into the lower end of the case 7 and has secured thereto a sweep 22 which, in this instance, consists of a pair of arms 23 secured to a supporting hub 24 which, in turn, is secured to the upper end of the tubular shaft 18. The arms 23 radiate from substantially diametrically opposite sides of the hub 24 and extend over the bottom wall 10 of the case 7 in slightly spaced relation thereto and adapted, when rotated, to sweep any material which may gather upon the wall 10 outwardly through an opening 26 provided in the bottom wall 10 near the outer edge thereof. This opening 26 is provided with a chute 27 which is secured to the underside of the wall 10 and adapted to convey material passing through said opening into a conduit or conveyor 28 adapted to convey the material entering therein to any desired place, such as a grinding mill (not shown) and for a purpose which will hereinafter be more fully understood.

Any suitable means may be provided for rotating the shaft 18 and sweep 22 such as a horizontally disposed shaft 30 positioned at one side of the tubular shaft 18 and which, in this instance, is journaled near its ends in suitable bearing members 31 and 32 secured to the bearing member 16 and supporting bar 17 respectively. The inner end of the shaft 30 terminates a short distance from the shaft 18 and is provided with a beveled gear 33 which is in meshing engagement with a similar gear 34 secured to the shaft 18 intermediate the bearing member 16 and wall 11. The outer end of the shaft 30 may be provided with any suitable means such as a sprocket 35 adapted to be connected by a chain or belt with a driving motor (not shown).

The upper end of the supporting shaft 15 extends a short distance above the tubular shaft 18 and has secured thereto a tubular supporting member 36 which rotatably supports the lower end of a vertically disposed drive shaft 37 which extends upwardly through the case 7 and housing 5 into a suitable gear case 38 which is mounted upon a pair of horizontally disposed bars 39 secured to the upper end of the housing 5. The upper end of the shaft 37 is journaled in the case 38 as at 40 and has secured thereto a beveled gear 41 which is in meshing engagement with a similar gear 42 secured upon the inner end of a horizontally disposed shaft 43 which has one end thereof journaled in the case 38 as at 44, while the other end of the shaft 43 is journaled in a bracket 45 secured to the supporting members 39.

A pulley 46 is secured to the shaft 43 intermediate the bracket 45 and the case 38, and is adapted to be connected by a belt or other suitable means to a motor (not shown) adapted to drive the shaft 43 and through the gears 41 and 42 to produce rotary movement of the shaft 37. The lower end of the shaft 37 may be, as shown, spaced from the upper end of the supporting shaft 15 by means of a steel ball 48 which rests upon the upper end of the shaft 15 and permits relative movement of said shafts with a minimum amount of friction.

The interior of the case 7 is provided with an annular partition or wall 50 positioned a short distance above the sweep 22 and which divides the interior of the case 7 into a collecting chamber 51 at the lower end of the case and a separating chamber 52 located in the upper portion of the case.

The inner opening as 50' of the wall 50 is of substantially the same diameter as the inlet chamber 12 to permit free circulation of air from the inlet chamber 12 upwardly through the collecting chamber 51 into the separating chamber 52. A baffle plate as 53 may, as shown, be secured to the upper portion of the bearing member 19 near the upper end of the chamber 12. This plate 53 is somewhat smaller in diameter than the inlet chamber so as to disperse to a certain degree, the air as it leaves the inlet chamber 12 and flows upwardly through the collecting chamber 51 into the separating chamber 52.

Within the separating chamber 52 is positioned a separating fan or beater 55 which, in this instance, consists of three vertically spaced hub members 56 secured to the drive shaft 37 intermediate the wall 50 and the upper end of the case 7. Each of the hubs 56 has secured thereto, a plurality of, in this instance six, horizontally disposed arms 57 which extend radially from the respective hub 56 in equal circumferential spaced relation. Each set of arms 57 gradually decreases in length from the lowermost set to the uppermost for supporting a plurality of, in this instance six, blades 58 which are secured to the outer ends of respective arms 57. The blades 58 extend upwardly from within a relatively short distance of the wall 50 to within a short distance of the upper end of the cap 8. The outer lower edges of the blades 58 terminate a relatively short distance from the side wall of the chamber 52, while the outer vertical edges of said blades taper upwardly in diverging planes from the lower ends thereof so that the upper ends of the blades are spaced a considerable distance from the adjacent portion of the side wall of said chamber to form a substantially conical-

shaped beater or fan in general outline. The lower ends of each blade also extend inwardly to within a short distance of the opening 50' in the wall 50 and are curved forwardly, as shown more particularly in Figure 4, to form sweep arms 58' adapted, during the rotation of the beater, to urge any material collecting upon the upper surface of the wall 50, outwardly towards the side wall of the chamber 52 and to cause said material to pass from the chamber 52 into the collecting chamber 51 through a plurality of circular openings 59 provided in the wall 50 and also through a pair of elongated slots 60 provided in said wall at diametrically opposite sides thereof intermediate the openings 59.

The upper end of the cap 8 is provided with a horizontally disposed substantially flat annular ring or wall 62 which has a pendent centrally located annular wall 63 which extends downwardly a short distance into the separating chamber 52 and is adapted to receive therein the upper ends of the beater blades 58. The inner chamber as 63' of the wall 63 is in communication with the opening 62' of the wall 62 so as to form a convenient passage from the chamber 52 into the chamber 9 of the housing 5 for the exit of the air and fine materials passing from the chamber 52. Within the chamber 9 is positioned an exhaust fan 65 secured to the shaft 37 to be rotated thereby in unison with the beater 55.

The housing 5 is provided with a tangential outlet opening 67 which is in communication with a pipe or conduit 68 having one end secured to said housing and the other end thereof secured to the supplemental separator 2 in communication with a tangentially arranged inlet opening 69 provided in the upper end of said separator. The exhaust fan 65, in this instance, is of somewhat less diameter than the exhaust chamber 9 and consists of a plurality of, in this instance six, radially disposed arms 70, each having secured to the outer end thereof a paddle 71 arranged edgewise vertically and adapted to draw air upwardly through the cylindrical case 7 into the exhaust chamber 9 and to force said air outwardly through the outlet 67 of the chamber and conduit 68 into the separator 2.

The separator 1 is also provided with an inlet conduit 73 which extends inwardly in a horizontal plane through the housing 5 with the inner end thereof secured in the adjacent portion of the cap 8 in communication with the separating chamber 52. The outer end of the conduit 73 is closed by a head 74 secured in any convenient manner to the conduit. A screw conveyor 75 is positioned within the conduit 73 and has the drive shaft 76 thereof extended outwardly through the head 74 in which it is journaled and has secured to the outer end thereof a sprocket 77 or its equivalent which is adapted to be driven from any suitable source of power, (not shown). An upright feed pipe 78 is secured to the outer end of the conduit 73 in communication with the interior of said conduit and is adapted to be connected in any suitable manner with the grinding mills for conveying the material to the interior of the conduit 73.

The separator 2, in this instance, consists of a vertically disposed cylindrical case 80 mounted upon a stand 81. The bottom 82 of the case 80 is disposed in substantially a horizontal plane and has extending centrally therethrough a shaft 83 which has the lower end journaled in a bearing support 84. To the upper end of the shaft 83 is secured a sweep 85 composed of a hub 86 mounted on the shaft and a plurality of, in this instance six, arms 87 which extend from the hub in substantially radial direction.

The arms 87 are of such a length as to extend substantially across the entire surface of the bottom 82 and are positioned in close proximity to said bottom for carrying the material which collects upon the bottom, outwardly toward the periphery thereof and discharge the same through an opening 88 provided in the bottom near the outer edge thereof.

A chute 89 is secured to the underside of the bottom 82 adjacent the opening 88 and is adapted to convey the material passing through said opening to a suitable conveyor 90 adapted to continuously move the material to some remote place, or the chute 89 may deposit the material into a suitable receptacle placed below the chute.

The upper end of the case 80 is closed by a conical wall 91 which has centrally secured thereto an air discharge pipe 92. This pipe extends into the interior of the case 80 to some distance below the inlet 69, while the upper end of the pipe is connected by a conduit 93 with the upper end of the dust collector 3. The intake pipe 13 for the separator 1 has the outer end thereof connected with the outer end portion of the air discharge pipe 92 so that air drawn into the interior of the case 7 by the action of the exhaust fan 65, will be taken from the interior of the air discharge pipe 92.

Any suitable means may be employed for driving the sweep 85, and for that purpose I have shown a horizontal shaft 95 journaled at one end in a bracket 96 secured to the bearing member 84 and at the outer end in a standard 97. The inner end of the shaft 95 has secured thereto a beveled gear 98 which is in meshing engagement with a similar gear 99 secured to the shaft 83. The outer end of the shaft 95 is provided with a sprocket or pulley 100 adapted to be driven from any suitable source of power, (not shown).

The dust collector 3, in this instance, consists of a pyramidal head and bottom 102 and 103 respectively, arranged in vertical spaced relation upon an upright frame 104 to which these members are secured in any suitable manner. The head 102 is provided with an inner chamber 106 which is connected with the conduit 93 leading from the separator 2 by means of an elbow 107 connected at one end to the conduit 93 and having the other end thereof connected to the head 102 at the vertex thereof. The bottom 103 is similar in construction to the head 102 except that it is arranged in reverse position.

The base walls, as 108, of both the head 102 and bottom 103 are provided with a plurality of, in this instance nine, aligned openings 109 which are connected by respective fabric tubes 110 secured at their ends in any well-known manner to the base members 108 so as to provide direct communication between the interior of the head and the interior of the bottom 103.

At the vertex of the bottom 103 is secured an outlet conduit 112, substantially rectangular in cross-section, which has mounted therein a valve member 113 mounted upon a horizontally disposed shaft 114 journaled in opposite side walls of the conduit 112. One end of the shaft 114 extends beyond the adjacent wall and has secured thereto a crank arm 115 by means of which the valve may be manually rotated.

The valve 113 consists of a plurality of, in this instance five, blades 116. These blades are of substantially the same width as the interior of

the conduit 112, and the length of the blades is such that the outer ends thereof will have an easy sliding fit in the conduit to permit the valve to be readily rotated, and at the same time, to prevent the material from passing between the edges of the blades and the wall of the conduit so that material contained within the bottom member 103 may pass from said bottom member only upon rotation of the valve 113.

Operation

When the separator 1 is in operation, the shaft 37 and, therefore, the beater fan 55 and the exhaust fan 65 are driven at a relatively high speed, which is approximately six hundred revolutions per minute, while the tubular shaft 18 and the sweep 22 are driven at a much lower rate of speed, say sixty-five revolutions per minute.

It is now obvious that the exhaust fan 65, while being rotated at the above-mentioned speed, will draw air from the conduit 13 upwardly through the chambers 12, 51, and 52 into the exhaust chamber 9 and force said air outwardly through the opening 67 and conduit 68 into the separator 2.

It will now be seen that when ground material, such as talc, is deposited into the feed pipe 78 from the grinding mills, that this material will be gradually fed to the separating chamber 52 by the action of the screw conveyor 75. This conveyor 75 is driven at a relatively slow speed so that the outer end portion of the conduit 73 will be maintained entirely filled with the material at all times so that said material will form a stoppage adapted to prevent the escapement of air from the separating chamber 52 through the inlet conduit 73.

As the material is forced into the chamber 52, said material will immediately come under the influence of the air within the chamber which is being agitated by the rapid rotation of the beater fan 55. The finer particles of the in-fed material are picked up by the circulating air within the chamber 52 and will be eventually carried to the interior of said chamber and the beater fan 55 to be carried upwardly by the current produced by the exhaust fan 65 through the openings 63' and 62' provided at the upper end of the case 7 into the exhaust chamber 9, while the coarser or heavier particles of the in-fed material will be thrown centrifugally to the periphery of the chamber 52 where they may gravitate toward the bottom wall 50 of the chamber. As these particles move downwardly, they will sooner or later come into violent contact with the lower portion of the fan blades 58 due to the close proximity of the lower ends of these blades with the wall of the chamber. As these heavier particles are buffeted about by the blades 58, the larger particles of the talc will be broken and disintegrated to such an extent that they will be picked up by the current of air in the chamber 52 and eventually be carried upwardly by the current of air produced by the fan 65 into the exhaust chamber 9, while the larger particles of foreign material, such as silica sand, will not be broken by the blades owing to the more tenacious nature thereof, and will eventually reach the bottom wall 50 of the chamber 52 where they will be swept toward the peripheral wall of the chamber by the action of the arms 58' where these particles may escape through the openings 59 and slots 60 into the collecting chamber 51. As these particles settle to the bottom 10 of the collecting chamber, they will again be moved outwardly by the action of the sweep 22 toward the periphery of said chamber and eventually be deposited through the opening 26 into the chute 27 and thence to the conveyor 28 which is adapted to return these coarser particles to the grinding mills where they may again be operated upon by said mills.

The air carrying fine particles of the in-fed material is forced by the exhaust fan 65 from the exhaust chamber 9 through the conduit 68 to the separator 2 wherein a greater portion of the material will fall by gravity to the bottom of the case 80, while the air and the remaining portion of the material dust will pass upwardly through the air discharge pipe 92. A greater portion of this air is drawn from the pipe 92 through the conduit 13 into the intake chamber 12 of the separator 1 and thence back to the interior of the separator where it is again drawn by the action of the exhaust fan 65 through the central portion of the separating chamber 52 where the air again picks up the fine particles of the in-fed material and carries the same into the exhaust chamber 9 and then this dust-laden air is again driven by the exhaust fan 65 from the chamber 9 through the conduit 68 into the dust collector 2 where the dust separates from the air current and falls to the bottom of the separator to be deposited by the sweep 85 into the chute 89.

Any of the air passing through the air discharge pipe 92 not drawn through the conduit 13 back into the separator 1, will pass through the conduit 93 and elbow 107 into the chamber 106 of the head of the dust collector 3 and then through the openings 109 into the tubes 110. The air will then pass through the fabric tubes 110 to atmosphere, while the dust will be retained by the tubes and either collect on the inner wall of the tubes or fall through the tubes and openings 109 into the chamber of the bottom 103 where this dust may be drawn off as desired by the manipulation of the valve 113.

In Figures 10, 11, and 12 I have shown a modified form of my novel separator wherein the beater fan and the exhaust fan are adapted to be operated at a much higher rate of speed than in the structure shown in Figures 1 to 5 inclusive and which has just been described.

The structure, as shown more particularly in Figure 10, consists of a case 120 mounted on a supporting frame 121. The case 120 includes a cylindrical intermediate separating chamber 122 and a cylindrical exhaust chamber 123 positioned above the separating chamber in spaced relation thereto and connected with the separating chamber by a passageway 124 which is of less diameter than either that of the exhaust chamber 123 or the separating chamber 122. The case also includes a pendent intake chamber 125 positioned below the separating chamber 122 which is provided with an inlet 126 at one side thereof connected with the inlet conduit 13 which may have one end thereof connected with the air discharge pipe 92 of the supplemental separator 2, as illustrated in Figure 1.

The supporting shaft 15' has the lower end thereof mounted in a bearing support 16' mounted on the bar 17' secured to the frame 121. This shaft extends upwardly through the bottom of the inlet chamber 125 and has rotatably mounted thereon the tubular shaft 18' which is journaled in the bearing member 16' at its lower end and has the upper end thereof terminating in the lower portion of the intake

chamber 125 and has mounted thereon a sweep 22' adapted to urge any material collecting on the bottom of the chamber 125 toward the periphery thereof and discharge the same through an opening 26' formed in the bottom of the chamber 125 into a chute 27' which is adapted to deposit the material into the conveyor 28. The upper end of the supporting shaft 15' is journaled in a bearing member 19' which is centrally secured in the intake housing 125 by means of arms 20'. This bearing member 19' rotatably supports the lower end of the vertical drive shaft 37'.

The drive shaft 37' is mounted concentrically with the chambers 122, 123, and 125 and extends upwardly through the chambers 122 and 123, and has the upper end thereof terminating a short distance above the chamber 123 and connected with the armature shaft 128 of a motor 129 mounted on the upper end of the case 120.

The tubular shaft 19' and sweep 22' may be driven in a manner similar to that shown in Figure 3 for the shaft 18 and which consists of a horizontally disposed shaft 30' mounted in bearings 31' and 32' and which has secured to the inner end thereof, a gear 33' meshing with the gear 34' secured to the shaft 18'. The outer end of the shaft 30' is provided with a sprocket or pulley 35' which is adapted to be actuated in any suitable manner by any convenient source of power for rotating said shaft.

The shaft 37' has secured to the lower end portion thereof a baffle plate or disk 53' which is positioned within the inlet chamber 125 intermediate with the intake opening 126 and the chamber 122 so that air entering the chamber 122 through the chamber 125 will be deflected outwardly towards the periphery of the chamber 125 just prior to entering the separating chamber 122.

The shaft 37' has secured thereto a beater fan 130 positioned in the chamber 122 and which is of substantially the same diameter as the passageway 124. The fan, in this instance, consists of a hub 131 and a plurality of, in this instance six, radiating arms 132. Each of the arms 132 has secured to the outer end thereof a blade 133 which is arranged edgewise vertically, with the upper ends thereof in close proximity to the passageway 124.

Within the exhaust chamber 123 is positioned an exhaust fan 135 which is of greater diameter than the beater fan 130 and consists of a hub 136 secured to the shaft 37' and a plurality of, in this instance six, radially disposed blades 137 secured in the hub 136 in equal circumferential spaced relation. The exhaust chamber 123 has an outlet opening 138 which extends tangentially to one side of the chamber and is in communication with one end of the conduit 68 which may have the other end thereof connected with the supplemental separator 2, in the manner illustrated in Figure 1.

The intake conduit 73, in this instance, is positioned above the separating chamber 122 and has the outlet end thereof in communication with the passageway 124 so that material deposited in the passageway 124 by the action of the screw conveyor 75 will come directly in contact with the current of air caused to pass upwardly through the passageway 124 by the action of the exhaust fan 135 so that the finer and lighter particles of the material will be carried directly into the exhaust chamber 123. The heavier particles of the material will fall downwardly and be engaged by the blade 133 of the beater fan 130. This action of the fan 130 upon the coarser particles of the material will break up and disintegrate the coarser particles of the major material, such as talc which it is desired to purify so that said material will be picked up by the current of air passing upwardly through the passageway 124 and be carried into the exhaust chamber 123, while the particles of foreign material, such as silica sand, will not be affected by the action of the fan due to their more tenacious nature and will gravitate toward the bottom of the intake chamber 125 where they will be swept outwardly through the chute 27' by the action of the sweep 22' and be returned to the grinding mills by the conveyor 28.

The dust-laden air entering the exhaust chamber 123 through the passageway 124 will be forced outwardly through the outlet 138 by the action of the exhaust fan 135 and will pass through the conduit 68 to the supplemental separator 2 where the particles of material will be separated from the air in the same manner as described for the apparatus shown in Figure 1 of the drawings.

It will now be observed that in both the constructions, as shown more clearly in Figures 3 and 10, the material is deposited in each instance into the separating chamber above the beating and separating fan in such a manner that the coarser materials gravitating toward the bottom of the chamber will come into contact with the blades of the respective beater so that said blades will disintegrate these particles to such an extent that a very high percentage of the material fed to the separating chamber to be purified, will be discharged from the exhaust chamber to be separated from the air in the supplemental separator 2 or other suitable means.

Although I have shown and described the preferred embodiments of my invention, I do not wish to be limited to the exact construction shown, as various changes in the size, form and relation of the parts thereof may readily be made, without departing from the spirit of this invention, as set forth in the appended claims.

I claim:

1. A separator of the class described including a separating chamber having an inlet opening and an outlet opening, means associated with one of said openings for producing a current of air through the separating chamber adapted to carry fine material from the chamber, a vertically disposed separating fan rotatably mounted in said chamber, the blades of said fan having their lower outer edges terminating in close proximity to the side wall of said chamber and their outer edges tapered upwardly in diverging planes, and conveying means adapted to deposit ground material into the chamber over said tapered portion of the fan so that heavier particles of the material not carried by the current of air in precipitating through the chamber, will come into contact with said separating means, be disintegrated thereby and then carried from the chamber by said current of air.

2. A separator of the class described including a separating chamber having an inlet opening and outlet opening, means associated with one of said openings for producing a current of air through the separating chamber adapted to carry fine material from the chamber, a vertically disposed separating fan rotatably mounted in said chamber, the blades of said fan having their lower ends provided with sweep arms adapted to urge any particles of material collecting on the bottom of

the chamber toward the peripheral edge thereof, and conveying means adapted to deposit ground material into the separating chamber adjacent the upper portion of the fan so that heavier particles of the material not carried by the current of air in precipitating through the chamber, will come into contact with said separating means, be disintegrated thereby and then carried from the chamber by said current of air.

3. A separator of the class described including a separating chamber having the lower and upper walls thereof provided with a central inlet opening and outlet opening respectively, said lower wall being provided with a material outlet adjacent the periphery thereof, means associated with one of said openings for producing a current of air through the separating chamber adapted to carry fine materials from the chamber, a vertically disposed separating fan rotatably mounted in said chamber, said fan being provided with sweep arms adapted to urge any particles of material collecting on the bottom of the chamber toward the peripheral edge of said chamber and deposit the same through the material outlet, conveying means adapted to deposit ground material into the separating chamber adjacent the upper portion of the fan so that heavier particles of the material not carried by the current of air in precipitating through the chamber, will come into contact with said separating means, be disintegrated thereby and then carried from the chamber by said current of air.

4. A separator of the class described including a case having a collecting chamber and a separating chamber connected by an air opening, said collecting chamber being provided with an outlet opening for material, means for producing a current of air through said chambers, beater means rotatably mounted in the separating chamber, a sweep member rotatably mounted in the collecting chamber, conveying means adapted to deposit ground material into the separating chamber over said separating means, and means for rotating the beater and sweep at different speeds.

5. A device for separating solid materials comprising in combination a separator chamber, conveying means for feeding ground usable and foreign materials into said chamber, means for separating fine, usable particles of the incoming material from the coarser or heavier particles thereof and for carrying said fine particles from the chamber, said separating means including a disintegrator element within the chamber having vertically disposed blades arranged with their outer vertical edges extending from in close proximity to the side wall of the chamber upwardly in diverging planes and across the normal stream of the incoming material in passing through the chamber at an angle thereto whereby said heavier particles of material will come into contact with said blades in precipitating through the chamber and be disintegrated thereby.

6. A separator of the class described, comprising in combination a collecting chamber having an inlet opening, an exhaust chamber having an outlet opening and a separating chamber, said chambers being arranged in co-axial relation with each other with the separating chamber positioned intermediate the collecting chamber and the exhaust chamber and connected with said latter chambers by passages of less effective area than that of the respective chambers and arranged concentric therewith, an exhaust fan within the exhaust chamber for drawing air and materials from the inlet opening through the collecting and separating chambers and discharging the same out through the outlet opening, a disintegrator element within the separating chamber, feed means for depositing ground usable and foreign materials over the disintegrator element, power means for operating the exhaust fan and disintegrator element in unison at a relatively high rate of speed, and separate means for removing waste materials collected in the collecting chamber.

7. A device as in claim 6 wherein the disintegrator element comprises blades arranged adjacent the passage connecting the separating chamber with the exhaust chamber in registration therewith and the feed means is connected with said passage.

8. A device as in claim 6 wherein the disingegrator element comprises a blade extending through the separating chamber in inclined relation to the axis thereof with one end thereof positioned adjacent the peripheral wall of the chamber and the other end arranged adjacent the passage connecting the separating chamber with the exhaust chamber in registration therewith.

9. A device as in claim 6 wherein the disintegrator element comprises a blade extending through the separating chamber in inclined relation to the axis thereof with one end thereof positioned in close proximity to the peripheral wall of the chamber and the other end arranged adjacent the passage connecting the separating chamber with the exhaust chamber in registration therewith, and the feed means is connected with the separating chamber in a position above and intermediate the ends of the blade of the disintegrator element.

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