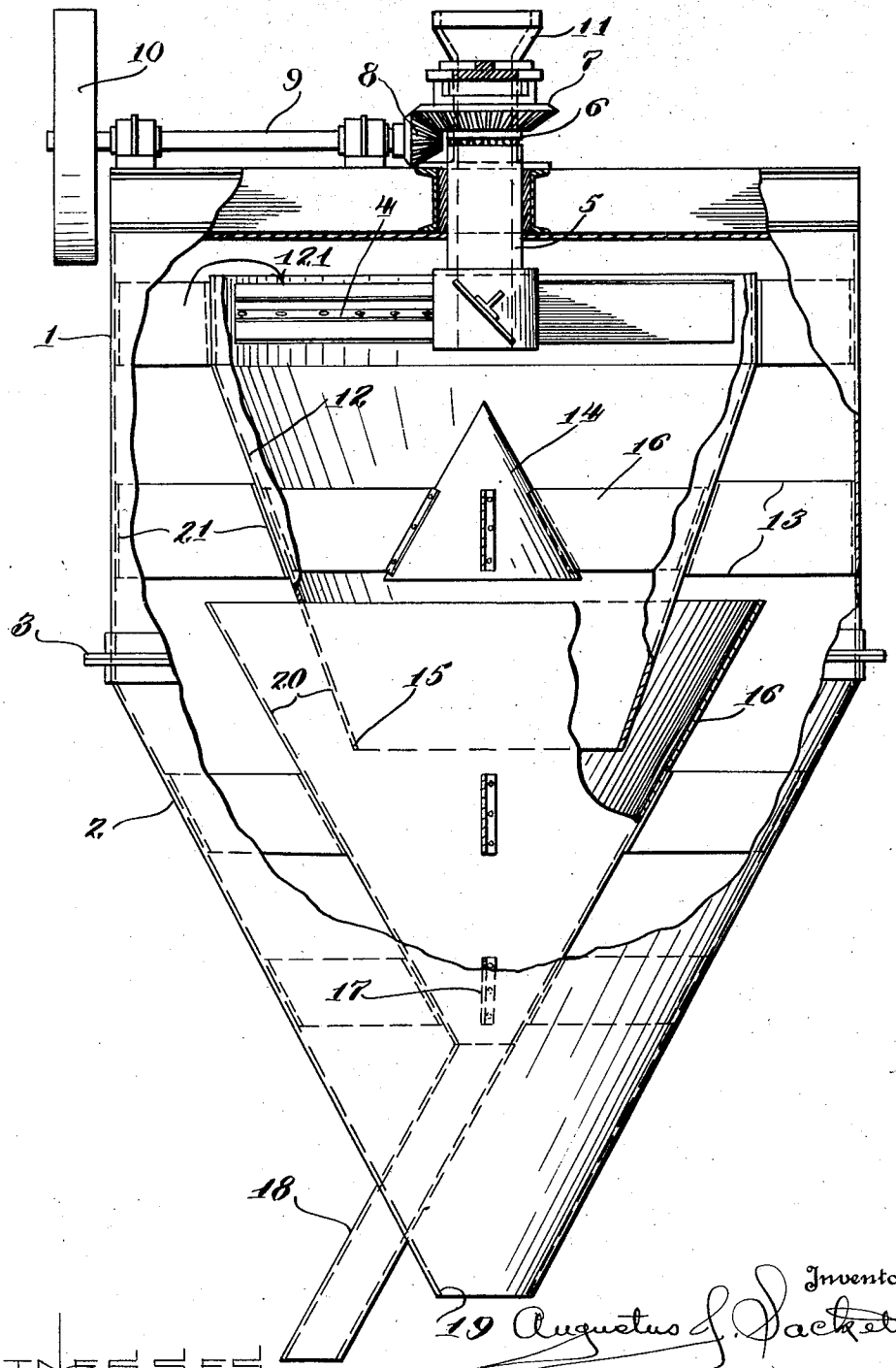
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DUST SEPARATING APPARATUS

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Witnesses

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DUST SEPARATING APPARATUS

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The invention relates to an air washing or dust separating apparatus which may be used in the manufacture of fertilizer in separating the fine dust from the coarser comminuted material or in cleaning sand in the manufacture of bricks or for cleaning various granular materials.

While there is a considerable variety of such apparatus on the market, it is all relatively elaborate and expensive and not proportionately efficient. The present invention has as its object the production of a simple and efficient apparatus for this purpose which can be produced in quantity at a comparatively small cost.

In accordance with the theory of operation of the improved apparatus, the material to be separated is introduced at the top center and passed downwardly over a spreader. The air used in washing or separating is directed downwardly in contact with the material as it strikes the spreader and through the stream of material as it drops from the spreader. After the first separation the washing air is deflected upwardly and passed again through the stream of solid and dust, this time in the opposite direction after which it enters an area in which the air velocity is checked, the dust which is carried upwardly by the reverse current being permitted to settle in the machine when it is led downwardly and discharged, the solid on the other hand passes directly down from the spreader without being in any way deflected by the air draft being discharged by way of a chute at one side of the dust discharge or in any convenient manner.

In the accompanying drawing I have illustrated an air washing apparatus embodying the features of the invention in the preferred form.

In the drawing:

The figure is an elevation of the apparatus, a portion being broken away to show the internal construction.

Referring to the drawing by numerals, the construction shown consists of an outer cylindrical casing 1, to the bottom of which is secured a lower section 2 shown as of conical form and referred to herein as an inclined discharge member 2. This, in effect, forms the lower half of the casing the inclined discharge member being secured to the casing by means of flanges 3. Within the casing near the top is a fan 4 having its blades horizontally disposed and its axis vertical. This fan as shown is mounted on a hollow vertical shaft 5 carried in suitable bearings 6 at the top. To this shaft is secured a bevel gear 7 driven by a bevel pinion 8 mounted on a horizontal shaft 9 carrying a pulley 10 at the side of the casing. The hollow shaft 5 is suitably connected at its upper end to a funnel 11. Surrounding the fan 4 extending downwardly and shown as tapering downwardly therefrom is a frustro-conical member 12. This is open at the top and bottom, and with this as with the other conical members while the frusto-conical formation is considered desirable it is not regarded as essential to the operation, tapered members of other than circular cross section being regarded as operative with almost equal efficiency, the word "conical" being used throughout for convenience and not for the purpose of limiting the meaning of the description or claims to members of circular cross section. The nozzle member may be supported by strips or straps 13 extending outwardly to the casing.

Near the center of this nozzle member is a deflector or spreader 14 for the material to be separated. This spreader is shown as in the form of a cone having the apex turned upwardly toward the center of the fan. The spreader may be supported in any suitable manner, as by means of sheet metal strips 16' secured to the spreader and to the inside of the nozzle extending outwardly radially from the spreader. As shown, the spreader 14 is of a diameter at the base slightly less than the diameter of the opening at the bottom of the frusto-conical member 12, said opening being indicated by reference character 15.

Surrounding the discharge opening of the member 12, at 15 and spaced outwardly therefrom and extending well above said discharge opening is an air deflector funnel 16 supported in the lower half of the casing 2 in any suitable manner as by means of sheet metal strips 17. All four conical members, nozzle 12, spreader 14, air deflector funnel 16 and inclined discharge member 2 are preferably arranged in axial alignment as shown, but this arrangement as well as the exact shape, may be varied to a considerable extent without departure from the principle of the invention. The air deflector funnel 16 is formed at the bottom with a discharge chute 18 for the solid material extending out through the casing and the lower inclined portion 2 of the casing is provided with a bottom discharge opening 19 for the dust.

In the operation of the apparatus the comminuted material to be separated which may be sand or coal, fertilizer or any material which can be treated in this way, is introduced at the funnel 11 and passed downwardly through the hollow shaft 5, the fan 4 being operated in right

handed rotation as seen from above by means of the pulley 10. The material passed downwardly through the tubular shaft 5 and discharged therefrom comes first in contact with the spreader 14 forming the material into a cylindrical stream which tends to pass downwardly through the opening 15 at the bottom of the frustro-conical member 12, which surrounds and leads the air downwardly from the fan. The draft thus directed downwardly through member 12, being confined between the member 12 and the deflector 14 passes with considerable velocity and in a downwardly inclined direction through the cylindrical stream of material being treated which drops from the deflector 14 toward the opening in the nozzle at 15.

In this way the air draft is caused to take up a considerable proportion of the dust from the material. The solid particles, as distinguished from the dust, fall directly into the air deflector funnel 16 where they converge toward the passage 18 which is filled almost completely by the solid portion of the material tending to permit the passage of air therethrough.

The air draft, as it passes downwardly from the nozzle opening 15, comes in contact with the funnel 16, thus closed at the bottom and the main portion of this air is deflected upwardly through the opening 20 between the member 12 and the air deflector funnel 16, passing again through the stream of material which is now dropping from the edges of the opening 15 in the member 12 and through said opening and into deflector funnel 16. In this way a second separation and washing is effected by the air current, and the dust which is thus almost completely removed from the material being treated, is carried upwardly with the air current to the space 21 between the casing 1 and the frusto-conical member 12. At this point the cross sectional area of the available air passage is greatly increased as compared to the area at 20, hence the velocity of the air is almost completely lost on account of its tendency to expand. In this way the dust is permitted to settle, falling on the walls of the inclined portion 2 of the casing by which in the form of the invention shown it is led to the dust discharge opening 19. The fan in its operation, as already described, gradually draws the air from space 21 upward to the suction side of the fan at 121 from which point the operation is repeated, the air being thus continuously circulated, the dust being dropped therefrom in the space 21 and discharged at 19. The clean solid on the other hand is collected by deflector funnel 16 and discharged simultaneously from the chute 18 so that the solid material is discharged continuously from the chute 18 and the dust from the discharge opening 19, throughout the operation of the machine.

I have thus described specifically and in detail a dust separating apparatus embodying the features of the invention in the preferred form in order that the manner of constructing, applying, operating and using the invention may be fully understood, however, the specific terms herein are used descriptively rather than in a limiting sense, the scope of the invention being defined in the claims.

What I claim as new and desire to secure by Letters Patent is:

1. The combination in a dust separator of a fan, means for driving the fan to provide a downward current of air, a frusto-conical member surrounding the fan, means for feeding comminuted material downwardly into said member at the center, a spreader beneath and in line with said feed and in said member so that the downward current of air passes through the material which is formed into a curtain by the spreader, an air deflector beneath the said member adapted to catch the solid material and pass it downwardly therefrom and to turn the air upwardly between the deflector and the frusto-conical member, a settling space for the air immediately above the deflector, the apparatus having a closed casing to provide for continuous circulation of the air, and being provided with a downwardly inclined portion beneath the settling space with an opening to discharge the dust, the air deflector having a discharge for the solid material of relatively small cross section as compared to the free cross section of said member around the spreader, the cleaned material serving to retard the passage of air through the discharge opening of the deflector causing the main portion of the air to be retained and deflected upwardly into the settling space.

2. In a separating apparatus a closed casing, a fan therein having a hollow shaft extending downward through the casing, means for introducing the material to be treated through the hollow shaft, a frusto-conical member surrounding the fan, the frusto-conical member having an opening at the top with which the fan registers, and means for driving the fan to force air downwardly into the casing, and a stationary spreader for the material beneath the fan, a deflector funnel surrounding the bottom of the said member, a settling space adjacent the upper portion of the deflector, a discharge for the dust beneath the settling space and leading downwardly therefrom, and a discharge passage for the solid material leading downwardly from the deflector the latter discharge being of relatively small cross section as compared to the free cross section of the frusto conical member around the spreader, the solid material serving to retard the passage of air from the deflector and causing the bulk of the air to be deflected upwardly into the settling space whereby the dust is dropped from the air and passed downwardly to be discharged.

3. In a dust separator, an outer casing having a lower portion of downwardly tapered conical formation with a dust discharge opening at the bottom thereof providing an inclined discharge member, a hollow vertical shaft rotatably mounted in bearings in the top of said casing and projecting into said casing for introducing comminuted materials into the casing, means for rotating said shaft, a fan having upwardly and forwardly inclined blades mounted on said shaft to rotate therewith in a horizontal plane to effect a downward draft of air in said casing, an open ended frustro-conical member of downwardly reducing cross section having its upper end surrounding said fan, providing a slight clearance therefrom, said upper end being spaced inwardly from said casing to provide an annular passage for the air around said frustro-conical member, which member extends downwardly from the fan and has a reduced opening below the fan, an upright conical spreader axially aligned with said hollow shaft and said fan and contained wholly within said frustro-conical member, said spreader being adapted to form the current of air issuing from said fan into a circular curtain, a downwardly tapered air deflecting funnel in said casing into which funnel the lower end of the frustro-conical member projects, there being an

annular opening between said funnel and said frustro-conical member through which the air rises, the lower end of said funnel being provided with a discharge chute passing through and out of said casing for discharging solid materials therefrom, the space within said casing above said funnel and surrounding said frustro-conical member providing a settling space for the rising air which is deflected by said funnel in which space the dust separates from the air and falls on the inclined discharge member to be discharged through said dust discharge opening.

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