W. E. ALLINGTON.

DUST COLLECTOR.

APPLICATION FILED MAY 7, 1906.

989,939. Patented Apr. 18, 1911

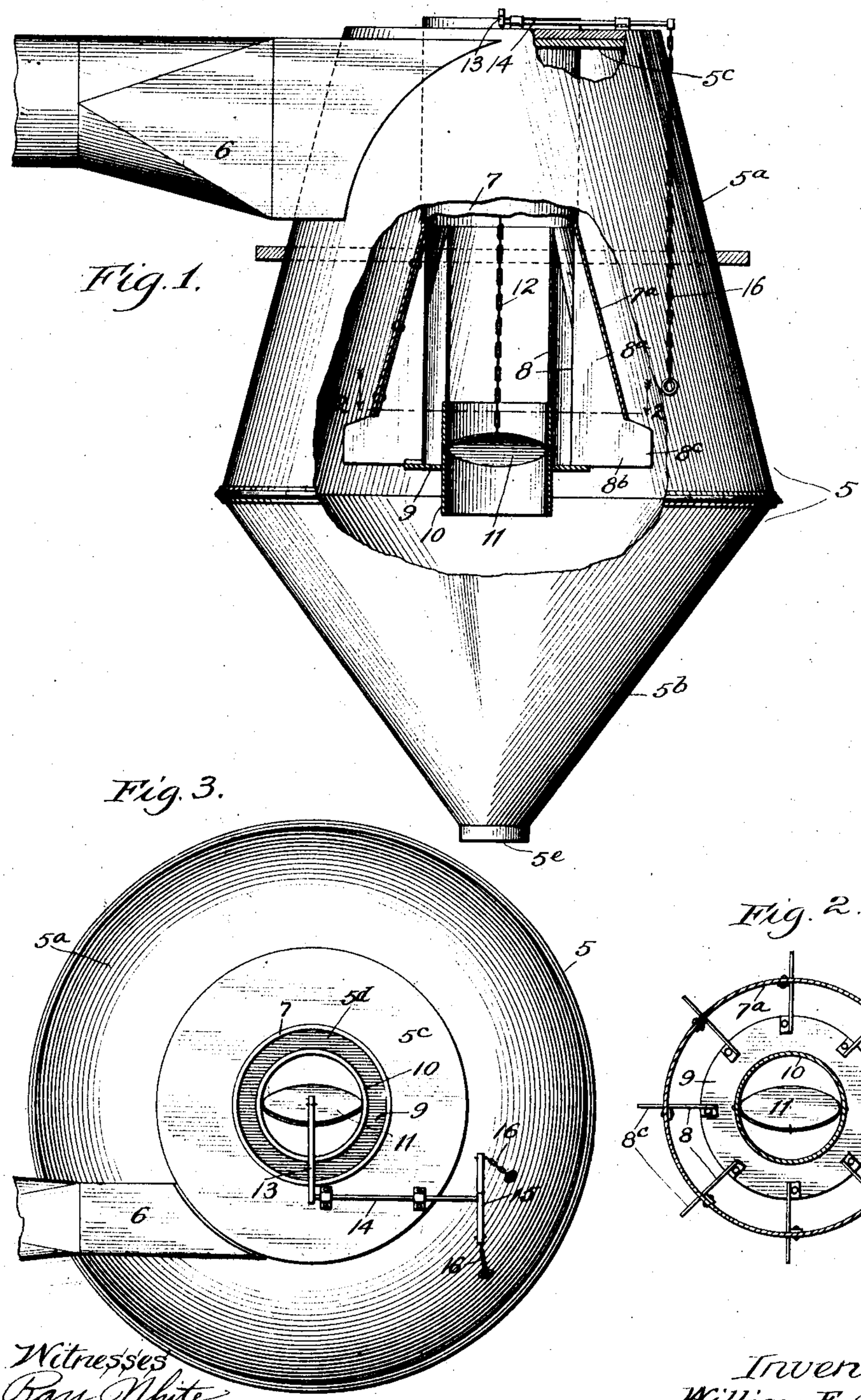

Fig. 1.

Fig. 3.

Fig. 2.

Witnesses
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UNITED STATES PATENT OFFICE.

WILLIAM E. ALLINGTON, OF SAGINAW, MICHIGAN.

DUST-COLLECTOR.

989,939. Specification of Letters Patent. Patented Apr. 18, 1911.

Application filed May 7, 1906. Serial No. 315,476.

To all whom it may concern:

Be it known that I, WILLIAM E. ALLINGTON, a citizen of the United States, residing at Saginaw, in the county of Saginaw and State of Michigan, have invented certain new and useful Improvements in Dust-Collectors, of which the following is a specification.

My invention relates to dust collectors, and more particularly to dust collectors of the centrifugal type, wherein a materials-conveying air-current is rotated, centrifugally to mass the material for delivery separately from the air. In some of its features, further, my invention is particularly advantageous in a machine wherein the zone of initial rotation of the air is smaller than the maximum diameter of the casing; as is the case in my prior Patent No. 772,689.

Among the salient objects of my invention is to provide a dust collector wherein the internal resistance or back pressure is minimized, or conversely stated, wherein power efficiency is high.

Another object is to provide a collector capable of embodiment with a casing of small cubical contents in relation to its working capacity.

Other and further objects of my invention may best become apparent to those skilled in the art from the following description taken in conjunction with the accompanying drawing, wherein—

Figure 1 is an elevation, with parts broken away, of a dust collector embodying my invention. Fig. 2 is a transverse section on line 2—2 of Fig. 1, and, Fig. 3 is a plan view of the machine, showing the damper adjusting mechanism.

Throughout the drawing like numerals of reference refer always to like parts.

In the drawing 5 indicates in general the collector casing comprising in general an upper section 5^a preferably of conoidal form, increasing in diameter from top to bottom, a lower section 5^b of inverted conoidal shape, and a deck 5^c covering the top section 5^a. The deck is provided with an axial air outlet 5^d, and the bottom of section 5^b is provided with a dust outlet 5^e.

6 indicates the tangential inlet, opening into the upper end of the casing at the smallest portion of the upper conoidal section, said inlet being preferably rectangular in cross section at its point of juncture with said casing, and relatively deep and narrow. This provision of a deep vertical inlet in combination with a conoidal upper casing effects delivery of all of the air in a narrow zone, all as close to the axis of the machine as the taper of the conoidal body and necessary width of the inlet will permit.

7 indicates the discharge pipe, or outlet stack, communicating with the outlet opening 5^d and extending downward therefrom to a point below the lower end of the inlet 6, preferably through or nearly through the upper chamber formed by the upper conoidal section. The upper end of the outlet stack 7 is preferably cylindrical to a point at or below the lower edge of the inlet, and below said point is enlarged to conoidal form, of greatest diameter at its lower end, as shown at 7^a, the stack as a whole, therefore, flaring downwardly and outwardly, or, in other words, being larger at its intake end than is its free outlet opening, which is usually the top diameter of the stack.

8—8 indicate deflectors, each comprising an upper portion 8^a of generally triangular form, connected with the inclined walls 7^a of the outlet stack and extending inward in a generally radial direction, preferably to approximate alinement with the upper cylindrical portion 7 of the stack. The lower portion 8^b of each deflector depends below the open enlarged end of the stack, and preferably extends in a generally radial direction from a point of approximate alinement with the cylindrical upper part of the stack to a point without the area vertically alining with the lower end of said stack, so as to provide below and without the open end of the stack deflecting wings 8^c, which extend preferably to approximate alinement with the mouth of the inlet, and are at their outer extremities free and unsupported. These wings may, as shown in the drawing, be straight, or they may, if preferred, be curved. The specific form and arrangement of deflectors shown may, of course, be varied, the essential feature being that by their association with a flaring stack, the rotation of the air be interrupted in a zone of greater radius than the free air outlet area, and that the air be delivered to the stack to be piped out of the machine without substantial violent rotation in the contracting portion of the stack.

The machine as thus far described is an operative structure which will operate as follows: The dust laden air being projected

into the smaller area of the upper portion 5ª of the casing by a fan or other suitable means, revolves rapidly, and passes downward in a cylindrical spiral, around the outlet stack 7, following the path of least resistance in the machine. The dust is centrifugally thrown outward, beyond this dominant air current into the surrounding air space afforded by the increasing diameter of the casing, within which space, outside the dominant air stream, is induced a whirl of less velocity. The air of the dominant or inner whirl, reaching the projecting wings 8ᵉ is prevented from further rotation and, seeking, of course, the path of least resistance, passes in through the area below and alining with the outlet stack 7 and thence passes upward through the outlet stack to escape. Dust is delivered out of the machine to the outlet 5ᵉ.

I have found that in order to maintain a high efficiency, or low back pressure, in the machine, it is necessary that the free area of the lower, open mouth of the outlet stack shall be considerably in excess of the area of the inlet 6, but that the area of the outlet opening 5ᵉ need be only comparatively slightly in excess of the area of said inlet 6 provided, of course, that the air in the stack be not in violent whirl. This I account for upon the theory that at the point where the air makes its turn from a direction spirally downward in the machine to a direction upward through the outlet stack, the air must be left free to form its own delivery curve unimpeded and without restriction, and, therefore, requires a relatively large escape area, but from whatever cause the effect ensues my experience has demonstrated that the fact is as herein stated, that if a relatively large, free area be afforded at the lower open end of the outlet stack, the upper portion thereof may be contracted to about the area of the inlet. Thus by enlarging the lower end of the outlet stack, as herein explained, and maintaining the upper cylindrical section 7 thereof of a sectional area only slightly in excess of that of the inlet, I am enabled to reduce materially the diameter of the casing 5 for a machine of any given effective working capacity, without detracting from the efficiency of the machine. Further, it will be apparent, that in any machine wherein the air is introduced at a radius beyond the zone of the effective outlet opening, the provision of air-whirl-destroying deflectors, associated with a flaring stack for educting the air as its rotation is stopped, serves to eliminate more or less of the centrifugal resistance which would otherwise resist the inward passage of the air from the inlet zone to the outlet area,—the ultimate efficiency depending, of course, upon how thoroughly centrifugal resistance is eliminated. Machines may be made on this principle of so slight back pressure that the loss is negligible. Further by the construction of the deflector as shown, to provide the free wings 8ᵉ, I am enabled to simplify the construction of the machine and to render it readily adaptable to the requirements of particular users. I have found from experience that while by making the diameter from tip to tip of opposing deflecting wings substantially equal to the diameter of the casing at the point of entry of the air, I am enabled to minimize back pressure in the machine. I have also found by experience that in handling some particular materials this maximum efficiency is obtained at the expense of a certain degree of leakage of dust, which leakage can be prevented by decreasing the size of the deflecting zone or area, wherein the deflectors operate to positively break up the whirl, and my present construction enables this reduction of the deflecting zone to be readily accomplished, as the free projecting extremities of the deflector wings 8ᵉ may be easily curved or trimmed down to narrow the deflecting zone to any desired extent within the limit prescribed by the radial extent of said wings, without requiring any other change in construction.

I further provide in my improved machine a supporting plate 9, secured to the inner ends or heels of the deflectors 8, and mounted in said plate 9 a relief pipe 10, the upper end whereof extends into the open end of the enlargement 7ª. 11 indicates a damper pivotally mounted in said pipe to open and close the same, and arranged for control from the exterior of the machine by any suitable means. Damper operating means are herein shown as comprising a damper rod 12 connected with the lever 13 carried by a rock shaft 14 mounted upon the deck 5ᵉ of the casing, said rod bearing at its outer end the T-lever 15, to opposite extremities whereof are secured operating cords 16, but the particular arrangement is unimportant. When the damper 11 is opened while the machine is in operation, the air in transit past the upper extremity of the relief pipe 10 produces a draft therethrough which relieves the pressure at the dust outlet 5ᵉ, and by varying the effective opening of the pipe 10, by means of damper 11, I am enabled to adjust to a nicety the force of the dust delivery. When the damper is closed, obviously, the structure 9, 10, 11 as a whole presents a baffle of greater radius than the effective air outlet radius, interposed between the air and the dust outlets, below the stack, to prevent upward axial air flow from the lower separation chamber to the stack.

While I have herein described in some detail a specific embodiment of my invention, which I believe to be of advantageous con-

struction, I do not desire to be understood as limiting myself to the specific details of construction further than as specified in the claims, as it will be apparent to those skilled in the art that numerous changes in the construction might be made without departure from the spirit and scope of my invention.

Having thus described my invention, what I claim and desire to secure by Letters Patent, of the United States, is:

1. In a centrifugal dust collector, the combination with a casing having a tangential inlet, a top air outlet and a bottom dust outlet, of an air stack opening to the air outlet, flaring downwardly and outwardly; and deflectors associated with said stack for breaking up the air whirl adjacent the lower end of the stack to a radius as great as the lower end opening thereof.

2. In a centrifugal dust collector, the combination with a casing having a tangential inlet, a top air outlet and a bottom dust outlet, of an air stack opening to the air outlet, flaring downwardly and outwardly; and deflectors extending within said stack arranged to interrupt the air whirl.

3. In a centrifugal dust collector, the combination with a casing having a tangential inlet, a top air outlet and a bottom dust outlet, of an air stack opening to the air outlet, flaring downwardly and outwardly; and whirl interrupting deflectors associated with said stack arranged below its lower end, and in radius extending to the edge thereof; the radially outer edges of said deflectors being unconfined to admit lateral passage of air therebetween.

4. In a centrifugal dust collector, the combination with a casing having a tangential inlet, a top air outlet and a bottom dust outlet, of an air stack opening to the air outlet, flaring downwardly and outwardly; and whirl-interrupting deflectors associated with said stack extending below and beyond the lower edge of said stack, said deflectors having their outer edges unconfined to admit air laterally therebetween.

5. In a centrifugal dust collector, the combination with a casing having a tangential inlet, a top air outlet and a bottom dust outlet, of an air stack opening to the air outlet, flaring downwardly and outwardly; and whirl-interrupting deflectors associated with said stack extending in generally radial lines below the edge of the stack within and without the area alining vertically with the lower end of said stack.

6. In a dust collector, a casing providing an upper area of smaller diameter and a lower area of greater diameter, and provided with an air-outlet in its top and a dust-outlet in its bottom, a tangential inlet opening into the upper, smaller area of the casing, an outlet stack extending from the outlet to a point below the inlet, said stack having a conoidal enlargement at its lower end in the area of the casing of larger diameter, and deflectors for breaking up the air whirl at the lower end of the stack.

7. In a dust collector, a casing providing an upper area of smaller diameter and a lower area of greater diameter, and provided with an air-outlet and a dust-outlet; a tangential inlet, opening to an upper smaller area of the casing, an outlet stack extending from the outlet to a point below the inlet and having an enlarged lower end, and deflectors extending below the open end of the stack within the area alining with its periphery.

8. In a dust collector, a casing providing an upper area of smaller diameter and a lower area of greater diameter, and provided with an air-outlet in its top and a dust-outlet, a tangential inlet, opening to an upper smaller area of the casing, an outlet stack extending from the outlet to a point below the inlet and having an enlarged lower end, and deflectors extending the length of the stack enlargement within said enlarged end and depending below the extremity of said stack.

9. In a dust collector, a casing providing an upper area of smaller diameter and a lower area of greater diameter, and provided with an air-outlet in its top and a dust-outlet, a tangential inlet, opening to an upper smaller area of the casing, an outlet stack extending from the outlet to a point below the inlet and having a conoidal enlarged end below said inlet, and deflectors below the open end of the stack extending in a generally radial direction within and without the area alining vertically with the periphery of said lower end of the stack.

10. In a dust collector, a conoidal casing gradually increasing in diameter from an upper area to an area therebelow, provided with an air-outlet in its top, and a dust outlet adjacent the bottom, a tangential inlet opening into the upper smaller area of the casing, an outlet stack extending from the air-outlet to a point below the air-inlet, said stack having a conoidal enlargement in the lower larger portion of the casing area, and deflectors for breaking up the air whirl at the lower end of the stack.

11. In a dust collector, a casing provided with an air outlet in its top and a dust-outlet in its bottom portion, a tangential inlet opening to the upper area of the casing, an outlet stack extending from the outlet to a point below the inlet, said outlet stack being of uniform diameter in its upper portion, and below the plane of the inlet provided with a conoidal enlargement, and deflectors for breaking up the air whirl at the lower end of said stack.

12. In a dust collector, a casing of smaller diameter adjacent its top and larger diame-

ter at a point below the inlet, said casing being provided with an outlet in its top and a dust-outlet in its bottom portion, a tangential inlet opening into the upper smaller area of the casing, an outlet stack extending from the outlet to a point below the inlet, said stack being of uniform diameter, through a vertical length coinciding with the vertical extent of the inlet, and below said inlet expanded in conoidal form in the enlarged area of the casing, and deflectors having wings projecting vertically below and radially beyond the lower extremity of the stack, the radial extremities of said wings being free and unsecured.

13. In a dust collector, a casing of smaller diameter at its top and larger diameter therebelow, provided with an air-outlet at its top and a dust-outlet adjacent its bottom, a tangential inlet opening into the upper smaller area of the casing, an outlet stack extending down from the outlet to a point below the bottom of the inlet, a plate below the lower end of the stack provided with an aperture, a relief pipe extending through said aperture above the lower end of the stack, and means for closing the relief pipe.

14. In a dust collector, a casing of smaller diameter at its top and larger diameter therebelow provided with an air-outlet at its top and a dust-outlet adjacent its bottom, a tangential inlet opening into the upper area of the casing of smaller diameter, an outlet stack extending down from the outlet to a point below the bottom of the inlet, a plate below the lower end of the stack, provided with an aperture, a relief pipe extending through said aperture above the lower end of the stack, a damper for closing or opening the relief pipe and means for operating the damper.

15. In a dust collector, a casing of varying diameter increasing from its top to a point below the top, provided with an air-outlet at its top and a dust outlet adjacent its bottom, a tangential inlet opening into the smaller upper area, an open ended outlet stack extending below the bottom of the inlet, and in the larger, lower area of the casing enlarged in conoidal form, a plate below the lower large end of the stack provided with an aperture, a relief pipe extending through the aperture to a point within the stack, and means for closing said relief pipe.

16. In a dust collector, a casing provided with a tangential inlet located near its upper end, an air outlet in its top, and a dust outlet at the bottom, in combination with an outlet stack within the casing, establishing communication between a vertically central portion of the casing and the air outlet, said stack being larger at its lower end than at its upper end; and internal radial deflectors in the stack.

17. The combination in a dust collector, having a tangential inlet and a conical dust-discharge, of a tapering tubular guard for the escape of the purified air, said guard flaring downwardly and outwardly, deflectors arranged within said tapering tubular guard, said deflectors being rigidly attached to the inner walls of said guard and arranged to deflect the escaping purified air from the side walls of the tubular guard to the central portion of said guard, for the purpose set forth, substantially as described.

18. The combination with a dust collector casing providing a top air outlet, a bottom dust outlet, and a tangential inlet, of an air stack flaring downwardly and outwardly, deflectors associated with the lower end thereof to break up the air whirl to the radius of said bottom end of the stack, and a centrally located, transverse baffle below the deflectors.

19. In a dust collector, the combination with a casing, providing an upwardly tapering upper portion having an air outlet in its head, and a bottom portion having a dust outlet therein; said casing inclosing an area wherein air may rotate; of an inlet spout for dust-laden air opening through the tapering upper portion of the casing near the smallest diameter thereof and having side walls tangentially disposed with respect to said tapering upper portion of the casing, said side walls being substantially parallel to the axis about which the air within the casing rotates.

In testimony whereof I hereunto set my hand in the presence of two witnesses.

WILLIAM E. ALLINGTON.

In the presence of—

COURTENAY D. ALLINGTON.

JOS. D. FOLEY.