No. 798,438. PATENTED AUG. 29, 1905.

O. M. MORSE.

DUST COLLECTOR.

APPLICATION FILED DEC. 29, 1904

2 SHEETS—SHEET 1.

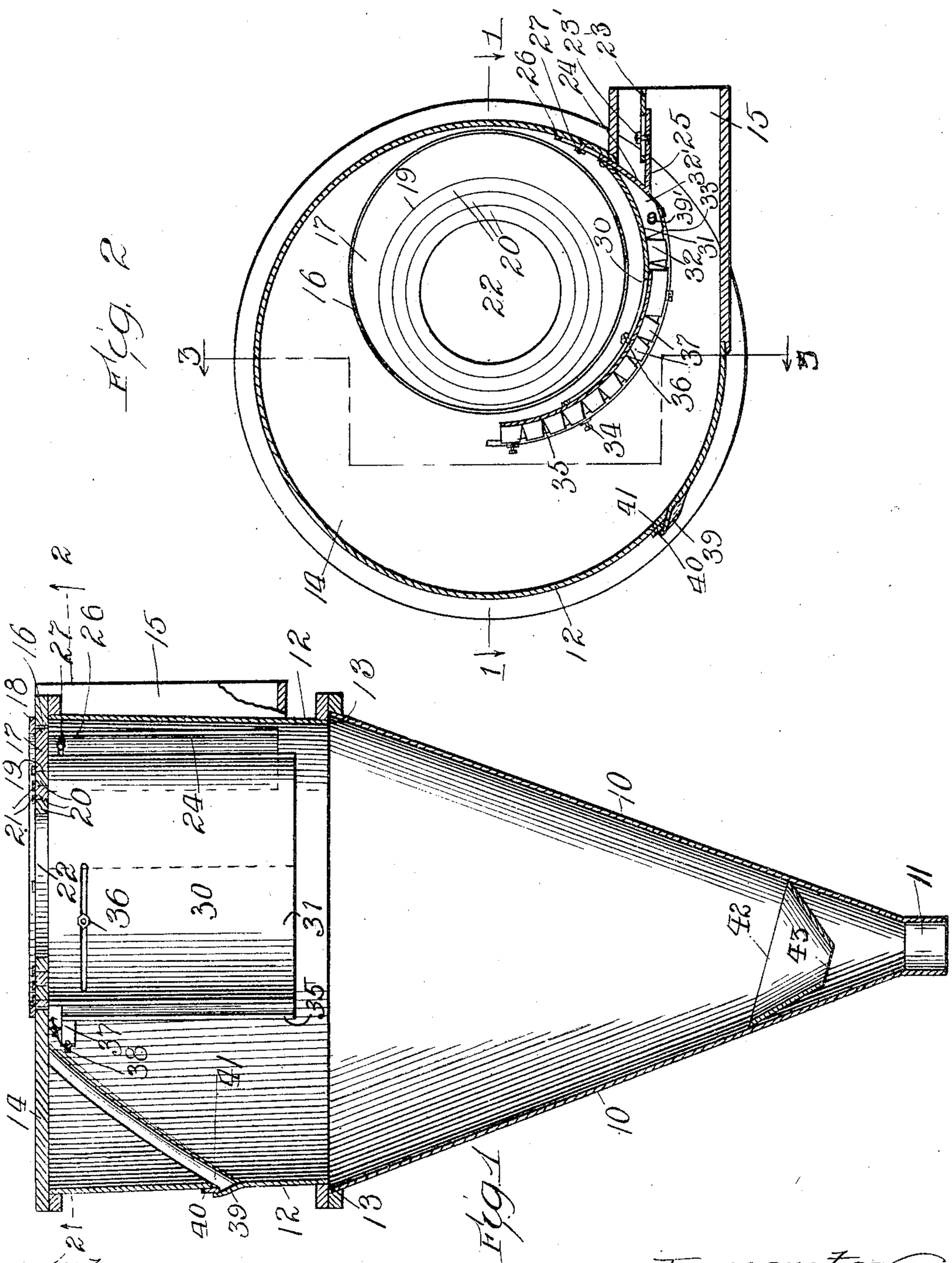

Fig. 2

Fig. 1

Witnesses.
Ray White.
Harry B. Whitte

Inventor:
Orville M. Morse.
By Dorée Bains Atty.

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Fig. 3

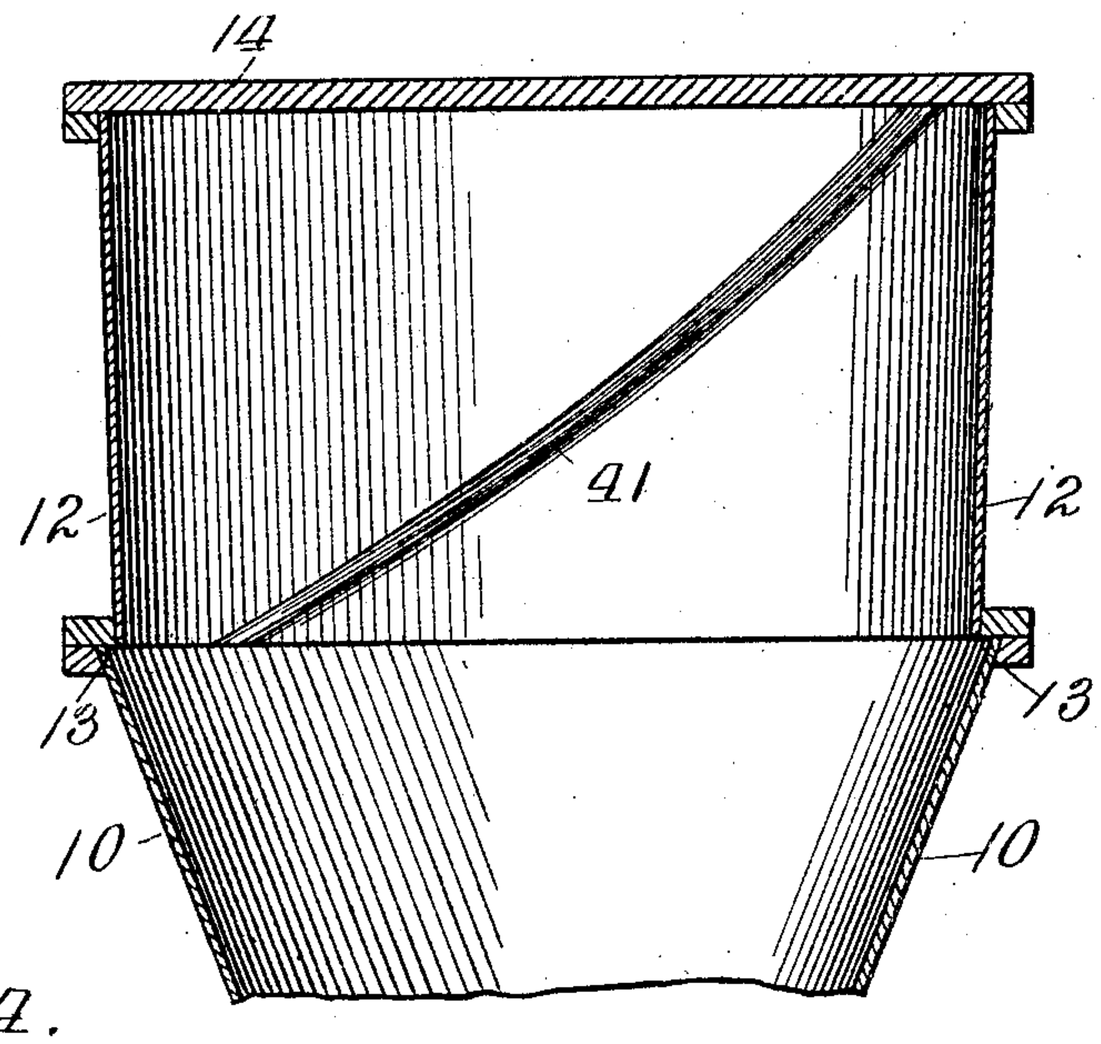


Fig. 4.

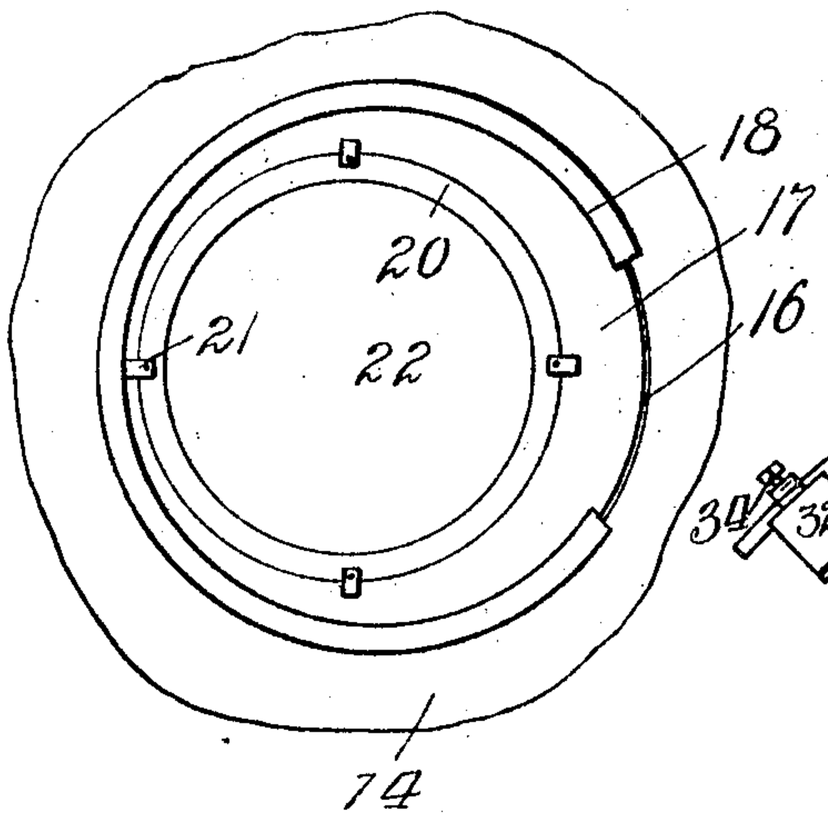


Fig. 5.

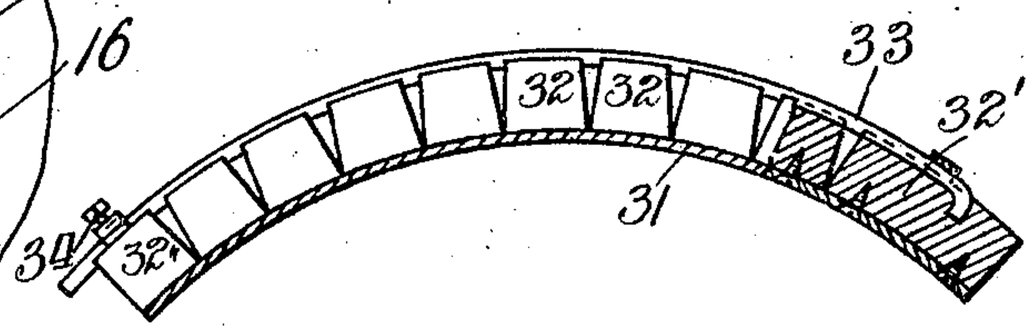
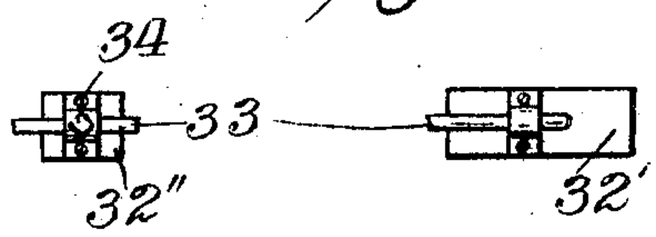


Fig. 6.



Witnesses:
Ray White.
Lamy D. Lewis

Inventor:
Orville M. Morse,
By Jones Dain Attys.

UNITED STATES PATENT OFFICE.

ORVILLE M. MORSE, OF JACKSON, MICHIGAN.

DUST-COLLECTOR.

No. 798,438. Specification of Letters Patent. Patented Aug. 29, 1905.

Application filed December 29, 1904. Serial No. 238,767.

To all whom it may concern:

Be it known that I, ORVILLE M. MORSE, of Jackson, in the county of Jackson and State of Michigan, have invented certain new and useful Improvements in Dust-Collectors; and I hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, which form part of this specification.

My invention relates to dust-collectors, and more particularly to centrifugal dust-collectors wherein the separation of the dust from the air is effected by the centrifugal action resulting from whirling or rotating the dust-laden air within the curved walls of a suitable casing.

One of the objects of my invention is to provide a centrifugal dust-collector having high efficiency and large capacity or, more specifically, a collector wherein the back pressure is minimized, so that the machine may effectively act upon the maximum amount of material for the power used.

A further object of my invention is to provide a machine of the class described wherein the massing and delivering of the dust is properly effected.

Another object of my invention is to provide a machine parts whereof are adjustable to render its action regulable to most advantageously conform to its conditions of use; and a still further object is to provide a generally improved and advantageous dust-collector of the character set forth.

In the drawings, wherein I have illustrated the embodiment of my invention in an operative machine, Figure 1 is a central vertical section on line 1 1 of Fig. 2. Fig. 2 is a horizontal section on line 2 2 of Fig. 1. Fig. 3 is a section on line 3 3 of Fig. 2. Fig. 4 is a detail of the air-outlet construction, and Figs. 5 and 6 are details of the deflector-wall construction.

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

In the drawings, 10 indicates the conical lower portion of the dust-collector casing terminating at its lower end in the axial dust-outlet 11.

12 indicates the peripheral wall of the head of the machine, preferably constructed to afford a slight taper or bevel downward and preferably slightly smaller at its lower end than the upper end of the conical portion 10, so as to leave at the juncture of the head and conical portions of the casing an annular shoulder 13.

14 indicates the deck or covering for the head end of the machine, and 15 indicates generally the tangential inlet-spout communicating with the head end of the machine, preferably at or near its periphery.

In the deck 14 I provide an air-outlet, preferably of circular shape and preferably with its center eccentric to the casing-axis. I prefer that the deck be so constructed that the position of the air-outlet relative to the inlet and to the axis of the casing may be adjusted and so that the size of said outlet may be varied. To this end I provide in the deck a circular orifice 16, preferably having its center eccentrically disposed relative to the axis of the casing. In this orifice I mount for rotation what I will term the "adjusting" plate or section 17, arranged in the same plane with the body of the deck and adapted to be rotatively adjusted in the orifice 16. The adjusting-plate 17 may be supported for adjustment in any convenient manner, being herein shown as provided at its edge with a projecting flange 18, secured to the top thereof and overlying the surrounding deck portion.

In the adjusting-plate 17 I provide an orifice 19 eccentric to the plate, preferably of circular shape, and for adjustment of the size of the free opening left in the orifice 19 I preferably provide a series of concentric nesting-rings 20 20, fitting one within the other and each provided on its upper surface with projecting lugs or clips 21 for support, as best shown in Fig. 4. It will be apparent that the rings 20 20 may be of any suitable diameters, so as to make the adjustability of the size of the free opening within the orifice 19 as fine as might be desired, but I have found that rings of an inch width each, adapted to reduce the diameter of the orifice two inches, give a very effective range of adjustment The free orifice 22 within the innermost ring 20 constitutes the air-outlet, and it will now be apparent that said air-outlet is adjustable as to size in the exemplified construction by the insertion or removal of rings 20 20 to any desired diameter and that the center of said orifice may be shifted within certain limits relative to the air-outlet and the axis of the casing, in the present embodiment by rotatively adjusting the adjustable plate 17. I also preferably provide means for varying the area of the inlet 15, and to this end I provide the vertically-extending plate 23, adapted to be transversely moved in the inlet 15 to vary the width thereof, said plate 23 being adjustably

associated, preferably through a slot-and-bolt connection 23′ and 27, with an angular plate 24, one portion 25 of which extends in parallelism with the plate 22 in intimate contact therewith and the other portion 26 of which is curved to conform with the wall 12 of the casing to lie close against the inner surface thereof and is held in intimate contact with said wall 12 through an adjustable slot-and-bolt connection 27. It will be apparent now that through the adjustment afforded by the slot-and-bolt connections 23′ and 27 the plate 23 may be moved transversely of the inlet 15 to any desired position, its associate member 24 of the inlet-adjusting means taking a proper relative position to constitute a practical extension of the wall 12 meeting an extension of the tangential inlet-wall 23. The object of this adjustment is to facilitate the application of dust-collectors to plants where the piping is already installed, as the width of the inlet-piping is found to vary in many instances. It will be apparent that once adjusted to the size of the inlet-piping the bolts 23′ and 27 of the adjustment are set and the adjustable member rigidly locked in position.

Within the head of the machine and extending from the deck to approximately the bottom of the inlet, or, as I will for brevity express it, in the plane of the inlet, I provide a division-wall or deflector, generally indicated as at 30. This wall is preferably substantially imperforate and preferably extends from a point of close contact with the peripheral wall of the casing in rear of the inlet in a relatively short curve of less than one complete turn to some point adjacent to the vertical path of air discharge alining with the outlet 22, the deflector 30 at its nearest point to the outlet being preferably a less distance from said outlet than the smallest effective width of the inlet-passage. The exact position and curvature of the division-wall 30 and its precise relation to the outlet are matters dependent to some extent upon the conditions of operation of the machine, and I therefore prefer that as to extent and curvature said division-wall 30 be adjustable. To this end I form the wall 30 in two parts, the main portion 31 being preferably secured to the curved portion 26 of the angular plate 25 25, constituting the means for adjusting the inlet, or, if said means be not employed, to the peripheral wall of the casing and thence curving around toward the remote side of the outlet 22. The part 31 of the division-wall or deflector 30 is preferably constructed in the manner best shown in Figs. 5 and 6, being secured to and supported by a series of blocks 32 32, having their inner edges in contact and slightly tapering toward their outer edges, so as to leave V-shaped spaces therebetween. To the radially outmost block 32′ is rigidly secured a band or wire 33 of springy material, which extends across the outer surfaces of the blocks 32 in a groove therein and makes adjustable connection with the radially innermost block 32″, preferably by means of a set-screw clamp 34. It will be apparent now if the set-screw clamp 34 be loosened the wall 31 may be bent to any desired curvature, within certain limits, and when so curved the clamp 34 may be again tightened and the deflector maintained in the desired curvature.

An adjustable extension member 35 is provided for the wall 31, said extension 35 being constructed as to adjustment of curvature in the same manner as the wall 31 and being secured to said wall for extension relative thereto, as by a bolt-and-slot connection 36. The blocks 37 of the member 35 overlie the blocks 32 of the wall member 31, so that in the wall 30 an open space 38 the height of blocks 32 is left directly below the deck from the inner end of member 31 to the extremity of the wall 30. It will be apparent now that within certain limits the wall 30 may be adjusted at pleasure as to extent and curvature and that by its connection with the inlet-adjusting means it is so disposed that it is automatically adjusted in its relation to the inlet consistently with the adjustment of the width of the inlet. If preferred, when the wall 30 is adjusted with the inlet-adjusting means it may be secured to the deck, as by screws 39′. This, however, is not essential.

In the head end of the machine I preferably provide means for positively directing the dust in a downward course as it reaches the wall of the casing, and to this end I may make in the wall of the casing a diagonal slot extending from the deck at a point approximately in line with the inner side of the inlet downward to the shoulder 13 at a suitable angle, preferably making from a quarter to a half turn about the casing-axis. The metal immediately below the slot is bent down, as at 39, and between the disassociated edges of the slot is inserted a wooden strip or block 40, secured to both the separated edges. In this way I provide a channel 41 extending down to and connecting with the annular shoulder 13; but any other construction providing a ledge partially encircling the casing-wall for the purpose described might be employed.

At the lower end of the machine I preferably provide a dust-discharge regulator consisting of a member having an aperture therein which may be adjusted in position relative to the axis of the casing and substantially closing the bottom of the casing save at said aperture. In the present embodiment of my invention 42 indicates a funnel-shaped member adapted to fit in the lower end of the casing part 10 and provided with an aperture 43 at its small end. It will be apparent that by changing the angle of the member 42 in the casing the position of the aperture 43 may be varied at will, and I have found with the construction described the member 42 may be

wedged tightly in place and will remain in adjusted position.

The operation of a machine constructed as above described will be as follows: The dust-laden air blown or drawn into the inlet 15 is projected tangentially into the casing member 12, where it is guided in a circular path by the casing-wall until near the end of its first circuit of the casing it encounters the division-wall or deflector 30, by which it is sharply turned in an arc or curve less than a complete circle in extent into a course within its first circuit, which course passes adjacent the air-outlet. While the air passes through the course described the dust is massed by centrifugal action at the periphery of the moving air-body, the greater part taking a general downward spiral course and some of the lighter dust proceeding with the air-body in the course described. The centrifugal effect of the whirl is accentuated by the short turn given the dust-laden air-body by the deflector 30, so that by the time the body of material sweeps past the point of closest proximity of the deflector to the air-outlet the residual dust carried by the air is massed in a peripheral path or stratum which does not extend to the outlet, while portions of the air, probably in virtue of the fact that the distance of the said point of the deflector from the outlet is less than the width of the inlet-opening, pass into the outgoing current and escape through said outlet. The dust stratum and a portion of the air not brought into the area of escape in alinement with the outlet proceed tangentially from the exterior of the curved wall 30 toward the casing-wall, so that by said wall and by the action of the constantly-renewed bodies of dust-laden air following the course marked by said peripheral wall the deflected unexpelled air is turned and proceeds on a second circuit within the casing. In this way a whirl or vortical rotation is set up in the upper portion of the chamber which will have its center or vortex at a point eccentric to the axis of the casing, such point being probably determined by the velocity of the current and the curvature of the deflector-wall. In the lower portion of the casing, below the deflector-wall 30, the whirling body of air dust seeks to establish a center about the axis of the casing, but under the influence of the eccentric whirl thereabove the axis of the whirl in the conical part of the casing is somewhat distorted, and the consequent axis or vortex of the whirling air-body, considered as a whole, is therefore not a straight line following the axis of the casing, as it is in most centrifugal dust-collectors, but is distorted.

It is in most cases important that the area of escape of the dust should approximately coincide with the axis of vortex of the whirl in order that the air may not flow out through the dust-outlet too violently. It will be apparent that the regulator 42 provides an effective means for exactly centering the aperture 43 relative to the distorted axis of the whirl at the portion of the casing wherein said member is contained.

It will now be seen that by my machine I provide in a casing which may be of the usual construction or of the preferred construction herein shown a means for deflecting the whole or substantially the whole amount of air introduced into the casing from its circular course adjacent the end of its first circuit of the casing in an eccentric path extending into such proximity to the path of the air escape (which it will be remembered should be located near the periphery of the whirl) that the air of inner stratum of said whirl which is freest of dust enters into the path of escape and leaves the machine, while the stratum wherein dust is massed proceeds across the casing into the whirl again. It will further be apparent that since the deflector 30 provides for the incoming air immediately after leaving the inlet a path of constantly-increasing width a syphonic or vacuum tendency will be set up in the area close to the deflector on the exterior side thereof out of the path through which the air in its introduction into the machine is violently projected. This vacuum tendency of course satisfies itself by withdrawing air from areas of greatest pressure in the machine. Therefore fine dust coming into an area lower in the casing which might lead it into the path of air discharge is drawn into said widening space and carried along into the whirl again to be driven to the wall by the centrifugal effect of the whirling air. Further, dust following close under the deck of the casing passes through the opening 38 into the low-pressure area.

It is to be noted that in the action described the air is propelled at its highest velocity and that its entire volume or substantially its entire volume is deflected, so that it reaches the point of closest proximity to the air-outlet at high speed. Consequently any dust that may lie in a path which causes it to traverse for a short distance beneath an open area of the outlet is, if it have sufficient ponderability, projected across the open space with such violence that its flight is practically uninterrupted by the counter upgoing current, and its escape from the machine is prevented. It is my aim in a machine of this type to have the velocity of the whirling air at its point of closest proximity of the deflector to the air-outlet greater than the velocity of the upgoing current of air escaping through the said outlet, so that the projecting current may have greater effect upon dust than the upgoing counter-current.

The exact size and location of the outlet, the curvature of the deflector-wall, and its proximity to the outlet are matters which may best be determined with reference to the par-

ticular installation, having due regard to the speed of the fan, the volume of material handled, and the character of dust. It will be apparent that the construction herein shown and described provides means for varying these characteristics of the machine within reasonable limit to secure the best results under any conditions. As a general proposition I find that increasing the distance from deflector to outlet by decreasing the outlet diameter results in closer dust-catching but greater back pressure, and vice versa.

I find that the slightly-beveled form of casing has a tendency to cause the dust to proceed toward the lower end thereof more quickly than it does in a straight head and tends to cause the dust to take a definite spiral course instead of spreading all over the surface of the casing, as in the ordinary centrifugal machine. In addition I find that the ledge or groove used in connection with the wall of the casing aids in determining the spiral and positively causing the dust-body to sharply descend into the conical part 10 and take a definite or clearly-marked track through the machine, which when once established remains constant until the conditions of operation are changed.

While I have herein described for purposes of a full disclosure an embodiment of my invention which I consider to be novel in detail and highly advantageous in construction, I do not desire to be understood as limiting myself to the details of construction further than as specified in the claims, as it will be apparent that the essential features of my invention might be embodied in machines of diverse forms without any of the refinements herein described, and numerous changes and modifications in mechanical construction might be made without departing 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 dust-collector, a separating-chamber formed with an inlet for the dust-laden air, an exit for the separated dust, and a deck provided with a portion movable in the plane of the deck and having an outlet-opening for the escape of purified air, whereby the position of said outlet may be varied.

2. In a dust-collector, a separating-chamber formed with an inlet for the dust-laden air, an exit for the separated dust, and a deck provided with a portion formed with an opening for the escape of the purified air, said deck being constructed to permit the position of the air-escape opening to be varied without substantially varying the configuration of the chamber.

3. In a dust-collector, a separating-chamber formed with an inlet for the dust-laden air, an exit for the separated dust, a deck provided with a circular opening, and a circular adjusting-plate in said opening rotatable in the plane of the deck, said plane having an eccentric outlet-opening therein.

4. In a dust-collector, a separating-chamber formed with an inlet for the dust-laden air, an exit for the separated dust, a deck provided with a portion formed with an opening for the escape of the purified air, said deck being constructed to permit the position of the air-escape opening to be varied without substantially varying the configuration of the chamber, and means for adjusting the size of said air-escape opening.

5. In a dust-collector of the class described, a casing having a tangential inlet, means for adjusting the width of the tangential inlet, comprising a laterally-movable plate substantially parallel with the direction of the inlet, and a part arranged to effectively connect the peripheral wall of the casing with said adjustable plate, and to form substantially an extension of said peripheral wall.

6. In combination, a casing of circular cross-section, a peripheral tangential inlet, an outlet eccentrically disposed relative to the axis of the casing, and a deflector extending in a short curve from a point contiguous to the peripheral wall to a point contiguous to the eccentric outlet.

7. In combination, a casing comprising a head having a curved peripheral wall and a conical bottom in open communication throughout its top with said head, a peripheral tangential inlet, an outlet disposed eccentrically to the axis of the casing, and a deflector extending in a short curve from a point of contact with the peripheral wall of the head in rear of the inlet to a point contiguous to the eccentric outlet.

8. In combination, a casing having a substantially circular head, a top or deck having an air-outlet therein, and a conical bottom provided with a dust-outlet, a tangential inlet and a deflector extending with reference to elevation, from substantially the plane of the top or deck of the casing to the bottom of the air-inlet, and, with reference to plan configuration, extending in a curve of less than a complete turn from a point contiguous to the casing-wall toward the air-outlet but stopping short of said outlet, and having its point of closest proximity to the outlet in front of its point of closest proximity to the path of the incoming air, with reference to the direction of rotation of the air.

9. In combination, a casing having a substantially circular head, provided with a top or deck having an air-outlet therein, and a conical bottom provided with a dust-outlet, a tangential inlet to the head extending downward from the top thereof, and a deflector extending with reference to elevation from the plane of the top or deck to the bottom of the air-inlet, and with reference to plan configuration, extending in a curve of less than a complete

turn from a point contiguous to the peripheral wall in rear of the inlet toward the air-outlet but stopping short of the same, and having its point of closest proximity to the air-outlet at a distance from said outlet less than the width of the inlet.

10. In a machine of the character described, a casing having a tangential air-inlet, an air-outlet and a dust-outlet, a curved deflector within the casing and means for adjusting the curvature of the deflector.

11. In a machine of the character described, a casing having a tangential air-inlet, an air-outlet and a dust-outlet, a curved deflector, blocks secured to said deflector and projecting therefrom, and a resilient band at one end connected to one of said blocks and at its opposite end adjustably connected to another block.

12. In a machine of the character described, a casing having a tangential air-inlet, an air-outlet and a dust-outlet, and an extensible deflector within the casing for deflecting air toward the air-outlet, said deflector comprising a plurality of sections movable one relative to another to vary their aggregate length.

13. In a machine of the class described, a casing having a dust-outlet, and a dust-discharge regulator within the casing comprising a partial closure for the bottom of the casing, having an opening therein adjustable as to position relative to the axis of the casing.

14. In a machine of the class described, a casing and its dust-outlet at the bottom thereof, concentric with the axis of the casing, and a dust-discharge regulator within the casing comprising a device having a perforation therein, for closing the bottom of the casing save through said aperture, said device being movable within the casing to vary the position of the aperture relative to the axis of the casing.

15. In a dust-collector, a substantially circular casing having a deck, a tangential inlet for delivering air into the casing to whirl therein, and a deflector extending downward from the plane of the deck, said deflector being eccentric to the casing and at one end contiguous thereto and interposed in the path of the whirling air to sharply deflect practically the whole body of incoming air into a distinct whirl eccentric to and of less diameter than the casing, said casing having an air-outlet opening into the whirl in the plane of the deck and located contiguous to the periphery of the eccentric whirl.

16. In a dust-collector, a casing structure wherein the air whirls, comprising a substantially circular head and a conical bottom, a tangential inlet at the top of the head, a deflector within the head interposed in the uppermost path of the whirling air to sharply deflect practically the whole body of incoming air into a distinct whirl eccentric to and of less diameter than the casing, and a deck for the head having an outlet therein opening directly into the area of the eccentric whirl.

17. In a dust-collector, a casing-wall substantially circular in cross-section, a tangential inlet for delivering air into the casing to whirl therein, a deflector eccentric to the casing and at one end contiguous thereto interposed in the path of the whirling air to sharply deflect practically the whole body of incoming air into a distinct whirl eccentric to and of less diameter than the casing, a deck for the casing, having an opening therein, an adjusting-plate having an outlet therein and otherwise closing the opening in the deck, said adjusting-plate being movable to vary the position of said outlet relative to the deflector.

18. In a dust-collector, a casing comprising a head having a curved peripheral wall, a conical bottom in open communication with said head, and a deck covering said head and having an outlet-opening therein, a tangential inlet for delivering air into the casing to whirl therein, a deflector eccentric to the casing and at one end contiguous thereto interposed in the path of the whirling air to sharply deflect practically the whole body of incoming air, into a distinct whirl eccentric to and of less diameter than the casing and including an area in alinement with the outlet in the deck, and means for adjusting the size of said outlet-opening.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

ORVILLE M. MORSE.

In presence of—
WILLIAM B. KNICKERBOCKER,
JOHN L. BENTLEY.