

O. M. MORSE.
 APPARATUS FOR DUST COLLECTION.
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958,666.

Patented May 17, 1910.

Fig. 1.

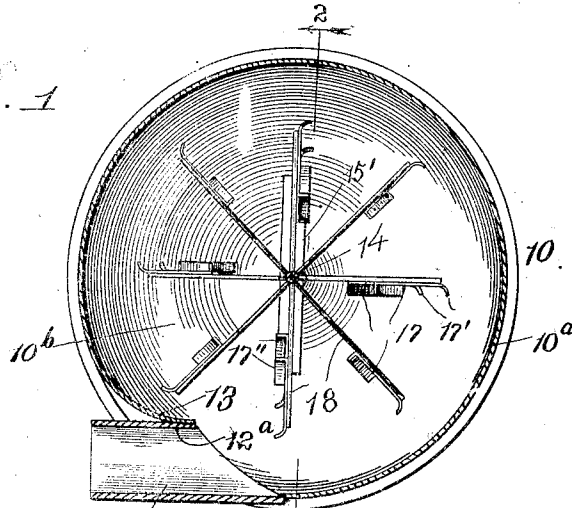


Fig. 2.

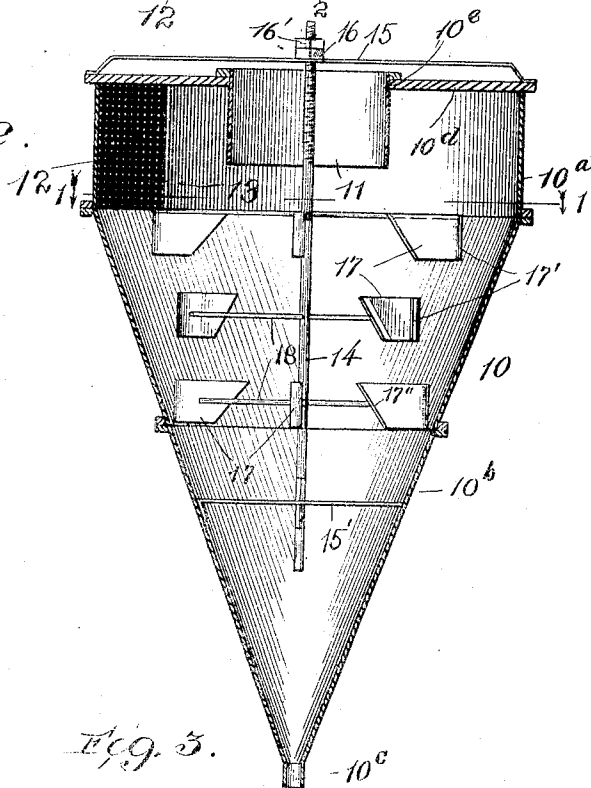
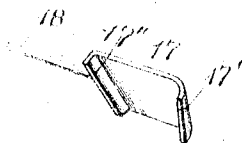


Fig. 3.



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UNITED STATES PATENT OFFICE.

ORVILLE M. MORSE, OF JACKSON, MICHIGAN.

APPARATUS FOR DUST COLLECTION.

958,666.

Specification of Letters Patent.

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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 Apparatus for Dust Collection; 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 has for its primary object to provide an improved apparatus for dust collection, and it relates more particularly to the collection of dust in machines of the type known as "centrifugal" or "vortex" collectors. In machines of this type the dust-laden air is caused to assume a whirling motion in a suitable casing, whereby the dust particles are thrown to the periphery of the whirl and the purified air is permitted to escape axially of the whirl. As a rule, particularly in machines adapted for use in flouring mills and the like, the casing is of metal, and has a frusto-conical portion; the air inlet is tangentially disposed; and the air outlet is at one end of the casing adjacent the axis thereof. The dust-laden air in practice is projected into the casing by means of a fan or blower. One of the principal objections to machines of this type has lain in the fact that as usually arranged and operated the "back pressure" in the casing cuts down the fan's capacity from 40 to 50 per cent. This in my opinion is due to two conditions, first, that to impel the air from its point of introduction at or near the periphery of the casing, to its axial path of efflux, the centrifugal force tending to throw the air particles from the center must be overcome by pressure, and second, that the path of travel of the whirl intersects the path of entrance of part of the incoming air at a salient angle, and tends to cut off the incoming supply. Another objection heretofore present in these machines has been imperfect separation of the dust and air, evidenced by the leakage through the air outlet of a small portion of the dust, principally of a light, impalpable character. This defect I account for on the theory that the air being denser at the periphery of the whirl than at its axis, the light impalpable dust is not sufficiently ponderable, or has

not sufficient mass, to be forced by centrifugal action through the denser peripheral strata of air to the casing wall, in machines as heretofore constructed, and accordingly such dust travels out into the escaping air. I have found, however, that if this dust can be once brought into close association with the casing wall, it will remain at the periphery of the whirl and will not escape with the outflowing air—probably because of electrical attraction of the casing for the dust particles.

The objects of my invention are to overcome to a large degree the defects of back-pressure and dust leakage, and to these ends it contemplates a centrifugal collector provided with means for deflecting portions of the air within a peripheral air belt toward the area of least air-density of the machine, preferably in a direction consistent with that of the outflowing air.

In the drawings wherein I have shown an operative form of apparatus embodying mechanical features of my invention and adapted for the practice of an advantageous method of dust and air separation; Figure 1 is a horizontal section on line 1—1 of Fig. 2. Fig. 2 is a central vertical section on line 2—2 of Fig. 1. Fig. 3 is a detail of a deflector.

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

10 indicates generally a casing which may be of any suitable form to radially inclose an area or chamber, adapted for the collection of dust by centrifugal action. Said casing 10 is herein illustrated as comprising a cylindrical portion 10^a, a downwardly tapering conical section 10^b, terminating in an open outlet spout 10^c, (all preferably formed of metal) and a deck or covering 10^d provided with an orifice 10^e preferably a in ing with the axis of the casing. This form of casing is well known in the art, and I do not desire to be understood as limiting myself to its use, as other known forms of casing might be used without departing from the spirit and scope of my invention.

11 indicates a tubular guard extending through the orifice 10^e and depending a suitable distance into the chamber.

12 indicates a tangential inlet spout opening into the separating chamber near the

periphery thereof. These parts broadly are well known in the art.

I provide in my machine a means for deflecting that stratum of air whirling in the plane of the inlet in such direction that it does not cross the path of the incoming air at an obtuse angle, but is thrown toward the axis of the casing in approximate concentricity or parallelism with the incoming air. To this end I extend the end of the inlet spout at the side nearest the axis of the casing a suitable distance into the casing, as indicated at 12^a, and associate therewith a deflector 13, forming a smooth curve with the casing wall 10^a, (of which in the present illustrative construction, it is an integral part) and terminating at the nose of the extension 12^a in substantial parallelism to the direction of said extension. I also provide in my collector means for positively directing bodies of air at different levels in the machine from areas within an undeflected peripheral air-belt toward the area of least air-density, that is to say, toward the axis of the whirl, in like direction with the general movement of the central column of air toward its point of escape.

In the specific structure 14 indicates a non-rotatable rod axially arranged in the casing and supported in suitable braces 15 and 15' conveniently secured to the casing structure. The rod is preferably screw-threaded at its upper end and vertically sustained by a nut 16 bearing on the upper brace 15.

16' indicates a lock nut for nut 16. It will be apparent that by turning the nuts 16' and 16 the rod 14 may be vertically adjusted.

Rigidly secured to the rod 14 are one or more deflectors extending from points suitably removed from the casing wall toward the axial rod, and shaped to deflect the air which impinges thereon in an inward and upward direction, that is to say, toward the axis of the casing and in the direction of flow of the escaping air.

In the present embodiment 17 represents a deflector, (best shown in detail in Fig. 3,) consisting preferably of a thin metal blade of suitable vertical extent, or width, and radial extent, or length, preferably having its outer end curved laterally, as at 17', in direction opposite to that of the air whirl in the casing, and having its inner end bent sharply as at 17'' in the same direction, to form a deflecting surface inclined upward and inward. Three sets of these deflectors, four in a set, are illustrated in my present embodiment, (though more or less of them may obviously be employed without departing from the spirit of my invention) each of the deflectors being suitably mounted on an arm 18 projecting radially from the rod

14. Each set of deflectors is preferably balanced or symmetrical, the four deflector-arms 18 of each set being disposed each at right angles to its adjacent fellows, and where a plurality of sets are employed they are preferably disposed in circumferential offset relation, each set breaking angles with the next subjacent set. The sets of deflectors may be vertically spaced apart at suitable distances, determined by the proportions of the machine, and the sets are arranged at appropriate distances from the rod, as may be desired. The deflectors of the upper set are preferably nearer the axis than the next subjacent set for reasons to be set forth.

In the operation of a centrifugal machine the air projected tangentially into the casing assumes a whirling motion and (in a casing of the shape shown) normally tends to follow a spiral path downward close along the wall of the chamber to the plane where centrifugal effect is overcome by the inward pressure of the air, in which plane or level the air tends to move spirally inward toward the axis and thence up and out through the tubular guard.

At the end of its first circuit of the casing in my improved machine the air is directed by the deflector 13, into a path substantially parallel to that of the incoming air. By this means the whirl of air is prevented from cutting off the inlet spout and the back pressure on the fan is considerably reduced. It will be noted that the deflector 13 is so shaped as to afford no abrupt projection in the path of the air, so that the dust particles will not be caused to rebound toward the center of the machine, but on the contrary, the dust being more ponderable than air and having, therefore, greater persistence of motion resists most strongly the deflection toward the axis, and is massed at the surface of the deflector more effectually than were it allowed to take a truly circular course.

It will be apparent that below the level of the deflecting wall 13, a peripheral space is left uninterrupted by deflectors, so that a peripheral belt of the air may whirl without interference. Bodies of air at different levels, between the axis and said peripheral belt contact with the deflectors 17 and are directed thereby toward the axis in the direction of the outlet, so that they join the escaping central air column and, by reason of the speed at which said air bodies are traveling, accelerate to a great extent the rate of upward movement of said escaping air. Further it is my theory that by directing such portions of the air between a peripheral belt and the axis toward the center, the volume of air in rotation is reduced and the outward pressure on the undeflected belt diminished.

Accordingly the components of back pressure upon the fan due to centrifugal force and the skin friction of the air upon the casing are greatly reduced. Further the deflection of the several strata of air tends to produce rarefaction at such levels and permits the air component of the undeflected peripheral belt to expand, thereby lessening its density to such an extent that the light dust particles may pass outward at the levels intermediate the deflected levels into adjacency to or contact with the casing wall.

It will be apparent that by adjusting the rod 14 vertically the thickness of the peripheral belt may be varied in the conical portion of the machine, so that by proper adjustment the air which contains but little dust may alone be deflected. In this connection it may be noted that I deem it desirable to have the spread of the uppermost set of deflectors less than that next below, as in the upper portion of the casing the dust is not as closely massed as lower in the machine, and the liability of dust, deflected with the air, escaping through the air outlet instead of being thrown back to the peripheral wall is greater than in the lower part of the casing.

While I have herein advanced theories as to the actions giving rise to the beneficial results following from my invention, and believe the same to be correct, such statements of opinion are given merely as affording the clearest understanding of the machine which I can now give, but whether or not my hypotheses are correct I have demonstrated as a fact in actual experience that the results sought, of material reduction of back pressure and dust leak, are attained by the practice of my invention. For the purposes of a full disclosure I have also described in detail one operative apparatus suitable for the practice of my invention, but I do not desire to be understood as limiting myself to the precise construction shown, as it will be apparent that numerous changes might be made therein without departing from the spirit and scope of my invention.

Having 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 tapering casing having a tangential inlet at its larger end, a dust outlet at its smaller end, and an air outlet in its top, of a unitary structure in the casing constituting a single deflector, arranged wholly below the level of the inlet, and extending from a point separated from the casing toward the axis of the casing, said deflector being shaped to deflect air from within an uninterrupted peripheral belt toward the casing axis and having its edge free and unconfined.

2. In a centrifugal dust collector, a casing wherein dust laden air whirls to centrifugally mass the dust in a peripheral belt of the whirl, said casing being provided with an air inlet and an air outlet both at its top, and independent deflectors at different elevations within and separated from the casing, each for deflecting bodies of air within the dust-laden peripheral belt toward the axis and each having all of its edges free and unconfined.

3. In a dust collector a casing having a tangential inlet and an axial outlet, of a deflector arranged out of contact with the casing in the path of rotation of air within a peripheral belt, said deflector having a portion between its outer end and the axis of the casing inclined relative to the axis and arranged to deflect material moving radially inward along the deflector toward the axial outlet.

4. In a dust collector a casing wherein the air whirls, said casing having a tangential inlet and an axial air outlet, of a deflector arranged in the path of rotation of the air having a radially disposed portion, an outer end portion bent in opposite direction to the direction of movement of the whirl of air, and an inclined portion relatively adjacent the axis arranged to deflect the air toward the axial outlet.

5. In a centrifugal dust collector, the combination with a tapering casing wherein the dust laden air may form a vortical whirl, having a peripheral, tangential inlet and an axial air outlet, both at the larger end, of means for deflecting the whirling air in the radial plane of the inlet toward the axis of the casing, and a deflector in another radial plane arranged to deflect air within a peripheral belt toward the outlet.

6. In a centrifugal dust collector, the combination with a casing wherein the dust-laden air may form a vortical whirl, having a peripheral tangential inlet and an axial air outlet of means arranged in the transverse plane of the inlet for deflecting the peripheral portion of the whirling air toward the axis of the casing as it approaches the inlet, and means in another transverse plane for deflecting bodies of air within a peripheral belt toward the axial outlet.

7. In a dust collector, a casing having a tangential, peripheral inlet, an axial air outlet, and a dust outlet; and affording a free space wherein air may vortically whirl, of a deflector unconfined at its outer edge, intermediate and separated from the vertical axis and the casing, extending into proximity to the casing and arranged to deflect air from points adjacent the casing and direct said air inward and upward toward the axial air outlet.

8. In a machine of the character de-

scribed, the combination of a casing having
a tapering portion, a tangential inlet to the
larger end, an air outlet in said end, and a
dust outlet in the smaller end, of a deflecting
5 structure comprising a support, a plurality
of independent blades secured thereto in
different directions and at different levels,
on generally radial lines, said blades being
suitably shaped to deflect air from points

radially remote from the casing axis inward 10
and upward, toward the air outlet.

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—

FORÉE BAIN,

JOHN L. BENTLEY.