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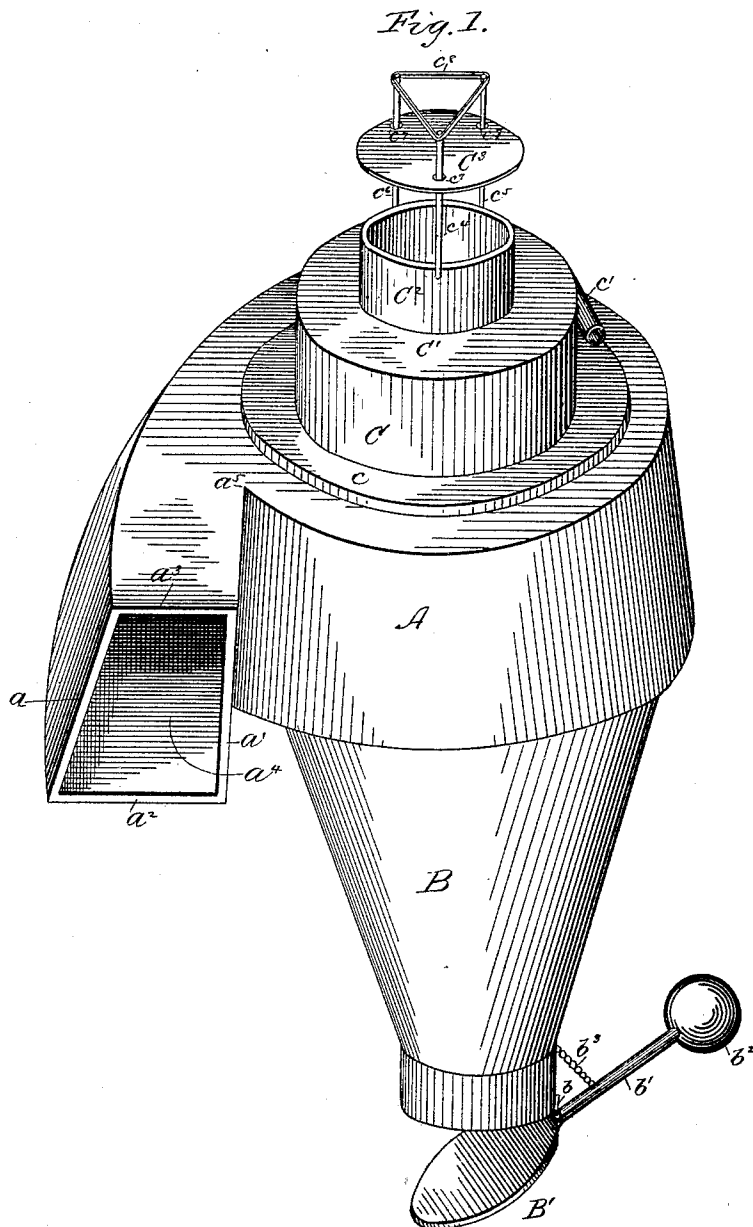
3 Sheets—Sheet 1.

W. E. ALLINGTON & W. H. CURTIS.

DUST COLLECTOR AND SEPARATOR.

No. 394,240.

Patented Dec. 11, 1888.



Witnesses:

J. R. Stuart,

Charles H. H. H.

Inventors:

William E. Allington, and
William H. Curtis.

By E. H. H.

Att'y.

(No Model.)

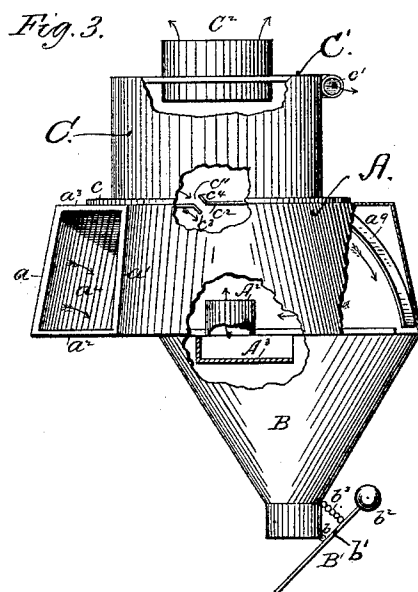
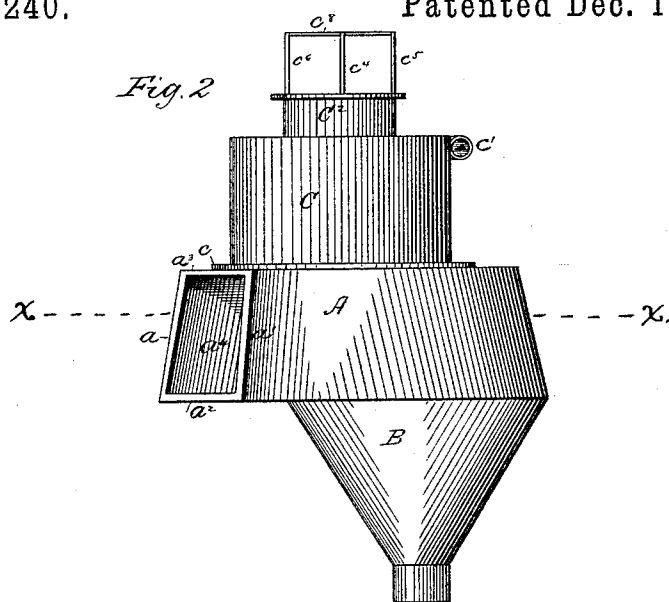
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W. E. ALLINGTON & W. H. CURTIS.

DUST COLLECTOR AND SEPARATOR.

No. 394,240.

Patented Dec. 11, 1888.



Witnesses:

J. R. Stuart

Leichfeger

Inventors:

William E. Allington
and William H. Curtis.

By

Emma H.
Atty.

(No Model.)

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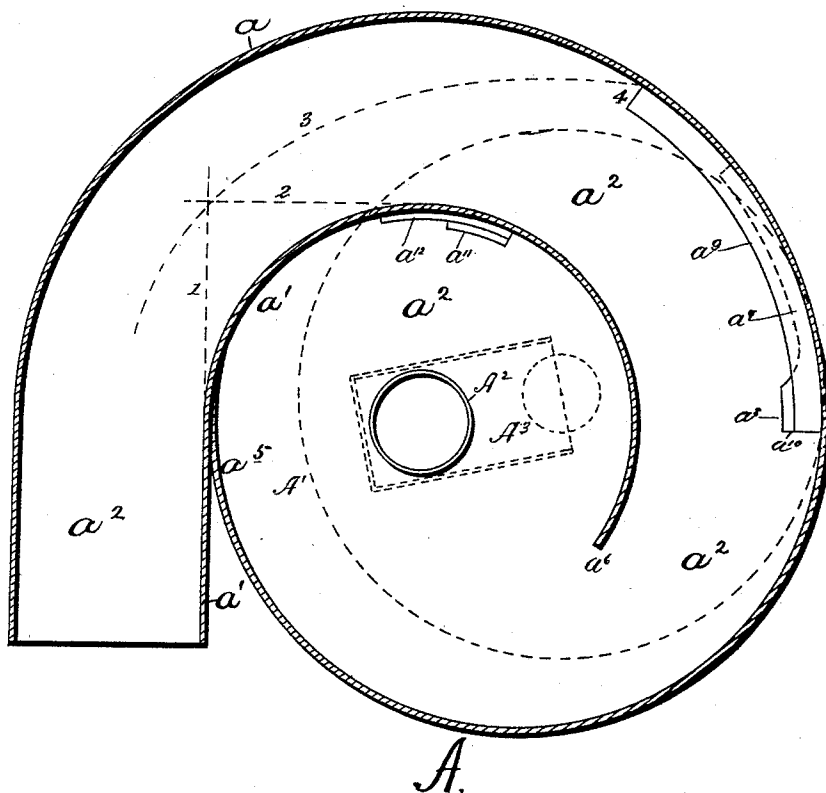
W. E. ALLINGTON & W. H. CURTIS.

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Fig. 4.



Witnesses:

J. R. Stuart

W. E. Allington

Inventors:

William E. Allington, and
William H. Curtis,

By *Emmett*,
Atty.

UNITED STATES PATENT OFFICE.

WILLIAM E. ALLINGTON, OF EAST SAGINAW, AND WILLIAM H. CURTIS, OF JACKSON, MICHIGAN.

DUST COLLECTOR AND SEPARATOR.

SPECIFICATION forming part of Letters Patent No. 394,240, dated December 11, 1888.

Application filed November 30, 1886. Serial No. 220,275. (No model.)

To all whom it may concern:

Be it known that we, WILLIAM E. ALLINGTON, a citizen of the United States, residing at East Saginaw, Saginaw county, State of Michigan, and WILLIAM H. CURTIS, a citizen of the United States, residing at Jackson, in the county of Jackson and State of Michigan, have invented certain new and useful Improvements in Dust Collectors and Separators; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

Our invention relates to dust collectors and separators; and it consists in the construction and arrangement or combination of the several parts thereof, which will be fully hereinafter described, and pointed out in the claims.

In our invention the heavier particles of dust are separated from the dust-laden air by centrifugal force and gravity, the former carrying them against the interior surface of a separating-chamber, which consists, preferably, of a spirally-arranged pipe or duct. The current of air carrying these heavier particles becomes more or less compressed in said chamber and discharges or forces them through openings in the bottom thereof and into a hopper below the same, the attainment of this result being assisted by the effect of gravitation upon said particles. The air-current containing the lighter particles of dust freed from the heavier particles passes into an upper separating-chamber through an opening or slot in the top of the lower chamber, where the finer dust is graded or separated, the heavier particles thereof being delivered back into said lower chamber for further separation, while the lighter particles are delivered into the open air or any suitable receptacle, the current of air being allowed to escape free from all dust.

Heretofore in machines of this class the dust has been collected as a whole without separation, and the operation has produced back-pressure of such a force as to necessitate the speeding up of the fan to overcome

such pressure, or the dust has been drawn through the collector by the suction of a fan in connection with a dead-air chamber, or has been separated by a fan and a wall of reticulated material, or by solid apertured walls, the dust being forced through said walls into the dead-air chamber and the air freed by the action of an auxiliary fan. Such devices to a great extent are impracticable and ineffectual in their operation and in the result desired to be obtained thereby.

One object of our invention is to so construct a dust collector and separator that no back-pressure will be created, so that friction will be reduced to a minimum, and one which is effectual in its operation and the result produced.

A further object of our invention is to provide a dust collector and separator which is so constructed as to prevent firing, by flying sparks or other cause, of the contents of the depository below the hopper or of the pipes leading from the machine to said depository.

We attain these objects by the mechanism illustrated in the accompanying drawings, wherein the same letters of reference indicate the same or similar parts in the several views, and in which—

Figure 1 is a perspective view of our improved device. Fig. 2 is a side elevation of the same. Fig. 3 is a side elevation, partially broken away to show the interior construction. Fig. 4 is a horizontal sectional diagrammatic view of the same, taken on the line $x x$ of Fig. 2.

A indicates a separating-chamber, consisting in this instance of a spirally-arranged pipe or duct, which forms the main separator of the machine. This duct or separator A has its walls a and a' formed of varying inclinations, the outer wall, a , being preferably of greater inclination from a perpendicular line than the inner wall, a' . The said walls $a a'$ are formed of suitable sheet metal, and have a bottom, a^2 , of wood covered with sheet metal, which is secured thereto, and a top, a^3 , of like construction, the said bottom a^2 covering the entire under portion of the duct and forming a divisional partition between the same and

a hopper, B, secured thereto. The top covering, a^3 , also forms a divisional partition between this portion of the duct and the parts situated on and above the same, for a purpose which will be more fully hereinafter described. By constructing the wall a of greater inclination than the wall a' the bottom a^2 thereof is increased in width, thereby facilitating the operation of the forces brought into action on the current of dust-laden air entering through the opening a^4 of the said duct A. The outer wall, a , is continued around the machine in spiral form and inclination and connects with the wall a' at the point a^5 . The wall a' continues to the interior of the machine to the point a^6 . A passage-way is thus formed between the two walls a and a' , which is of the same width throughout and which, at the end a^6 of the inner wall, a' , opens into the central portion, A' , of the machine, which is circular, or nearly circular, in form. In the bottom portion, a^2 , leading to the hopper B and adjacent to the wall a , an elongated opening, a^7 , is formed, which at one end, as a^8 , is constructed of dimensions somewhat larger than its remaining portion, which is uniform in its width until it reaches said enlarged portion a^8 .

To the inner side of the wall a , and conforming to the contour thereof, a wooden metallic-covered strip or deflector, a^9 , is secured, which extends from the rear boundary, a^{10} , of the opening a^8 upward on a curved incline to near the top portion of the said wall a , as shown in Fig. 3. This strip a^9 is constructed of such width and length as to extend over the opening a^7 in both directions, with the exception of a part of the opening a^8 , which extends out beyond the said deflector. In the central portion, A' , and adjacent to the inside of the wall a' , another opening, a^{11} , is formed in the bottom a^2 , which is somewhat smaller than the opening a^7 , heretofore described, said opening a^{11} having in like manner an upwardly-inclined curved deflector, a^{12} , which is similar in construction to the deflector a^9 , but of smaller dimensions, and is secured to the inner side of the wall a' .

In the central part of the portion A' a short pipe, A^2 , is mounted upon the bottom a^2 , which also opens into the hopper B. On the under side of said bottom and beneath the pipe A^2 , which opens into the said hopper B, a metallic box, A^3 , is secured. This box is constructed with an open top, which is secured directly against the bottom a^2 , and with closed sides and one end, the other end being left open, and extends some distance to one side of the opening of the pipe A^2 , all of which is fully illustrated in Figs. 3 and 4.

The hopper B is secured to the bottom a^2 , the central vertical line of which is situated considerably to one side of the central vertical line of the other parts of the machine, and, consequently, the main opening into the said hopper, by means of the pipe A^2 , is situated to one side of the central internal por-

tion of the hopper and near the inner periphery thereof. By means of the construction just described any sparks which might enter the top of the machine are caught in the box A^3 , and by the situation of the said hopper B to one side of the under portion of the duct A the collection and separation of the dust from the dust-laden air is greatly facilitated. A suitable cover, B' , is attached to the lower open end of the hopper B by means of a hinge, b . This cover or door has an arm, b' , secured thereto adjacent to the point where it is hinged to the hopper, the outer end of said arm b' being constructed with an integral ball or weight, b^2 .

Attached to the arm b' is one end of a fusible link, b^3 , which is secured at its other end to the lower portion of the hopper B. The cover or door B' is adapted, normally, to remain open; but in case the contents of the depository under the hopper should become accidentally ignited the heat produced by the burning material will be transmitted to the hopper, which will cause the fusible link b^3 to melt, and the weight b^2 on the arm b' , actuated by gravity, will drop and close the cover or door B' against the lower portion of the hopper B, and thereby readily cut off communication between the burning contents of the depository under the hopper, the machine, and the room or building in which the connecting-pipes may be situated, thus preventing serious damage to the remaining portions of the building, which might otherwise be liable to occur.

On the top portion of the separating-chamber A a wooden ring or collar, c , is situated, to which is secured a cylindrical sheet-metal pipe or chamber, C, which is secured to the top a^3 of said chamber A, and has a metal-covered wooden top, C' , and also an exit-pipe, c' , which is secured on one side of the upper part thereof, for the escape of the finer parts of the material being separated, which may be either delivered into the open air or any desired receptacle. To the wooden ring or collar c is secured a metallic plate or disk, c^2 , which is arranged inside of the chamber C and formed with a slot, c^{11} , which extends entirely across the same, one edge, c^3 , of said slot being bent downward and the other edge, c^4 , bent upward. These bent edges of the slotted disk permit of the upward passage of the air and fine dust from the main separating-chamber along the central portion of said slot c^4 , or in a line near the axial center of the air-escape pipe in the top of the chamber C, while the end portions of said slot, where there is little or no upward air-current, allow the heavier particles of the fine dust, which have accumulated in said chamber C, to pass back into the main separating-chamber A, where they are either subjected to further separation or passed through the openings in the bottom thereof into the hopper.

In the top C' of the chamber C a pipe, C^2 ,

is secured and forms an exit-opening for the passage of purified air from said chamber C.

On the top portion of the pipe C² three metallic uprights, c⁵, are secured, preferably in the form of a right-angled triangle. A cover-plate, C³, provided with suitable apertures, c⁷, is placed over the uprights c⁵, and cross-pieces c⁸ are secured to the top portions of the uprights, and the said cover-plate is thus retained in such a manner as to always be in a position to close the top opening of the pipe C². The apertures c⁷ in said plate are constructed of such size as to permit an easy motion of the cover thereon. This cover is opened by the outflowing air, which causes the plate to raise the air blowing upward and off the periphery of the said cover, and when the action of the said air-current has ceased the said cover drops down by gravity upon the top of the pipe C². By the use of this automatically-operating cover a further protection is afforded against an ignition of the contents of the machine by preventing the entrance of flying sparks which would otherwise be liable to drop into the pipe C² into the main body of the machine.

From practical tests and observations, the operation of our improved machine, if the above construction is fully carried out, we have found as follows: The current of dust-laden air, created by a fan situated in a suitable relative position to the machine, is driven into the opening a⁴ of the duct or separator A. The tendency of the current would be to take a direct line, as 1, Fig. 4, tangential to the wall a' and strike the wall a at a point directly opposite; but when the current flies off from the wall a' by reaction it is deflected, or its direct course swerved from a true line, as indicated by the line 2, and the current thence takes about the course indicated by the line 3, and does not fully strike the wall a until it reaches about the point 4 thereof. As the current comes into the duct, as heretofore described, it is obvious that it will carry particles of varying specific gravity, and that the particles of the greatest specific gravity will tend toward the lower portion or periphery of the bottom a² of the duct A owing to their greater specific gravity. It is not to be understood that the entire current of dust-laden air which enters the duct is deflected, as the greater portion of the lighter particles pass around with the current into the central portion, A'. The layer of dust and air, which strikes at or about the point 4 of the wall a, is to some extent compressed as it passes under the deflector a⁹, owing to the downward inclination of the said deflector, and is forced through the opening a⁷ into the hopper B with great momentum and accelerated force. This opening a⁷ is formed of considerable length, so that the exit of the current carrying the heavier particles will not be all at one point, thereby preventing a choking of said opening or exit.

If a portion of any of the particles should fail to pass through the opening at the elongated part thereof, or the exit of the material should be of such force as to cause a rebound or a tendency to jump the smaller portion of the exit, they will be caught by the enlarged portion a⁸ of the said opening and forced to pass down into the hopper B, where the heavier particles are caused to fly off from the current of air, due to their momentum, and are deposited in the said hopper. The remaining portion of the current which enters the separator A and carries the lighter particles passes on around at great velocity, entering the central portion, A', thereof, and circulates around the pipe A², rarefying the air at this central point, which produces a suction, and that portion of the current of air which has passed into the hopper B and is freed of the heavier particles is then drawn up through said pipe A² and set in circulation with the current in the portion A', and, centrifugal force being again brought into action, the heavier particles are thrown against the wall a' and are forced through the opening a¹¹ by means of the deflector a¹² into the hopper B, this operation being similar, only on a smaller scale, to the action of the opening a⁷ and deflector a⁹. The current of air remaining in the central portion, A', which contains the still lighter or explosive particles of the material being separated, is then circulated in a similar manner, the current of dust-laden air revolving spirally in an upward direction and passing into the chamber C through the slot c¹¹ of the plate or disk c², where the heavier particles are separated, accumulated, more or less, and passed down through the end portions of said slot c¹¹ into the main separating-chamber A, and thence into the hopper B through the opening a¹¹, the finer particles passing out through the pipe c' into the open air or any desired receptacle, while the main air-current, freed from all dust, escapes through the pipe C² into the outer atmosphere, as above described. This plate or disk c², formed with the slot c¹¹ and the bent edges c³ and c⁴, has an additional function to that above described, in that it acts to retard the too free escape or passage of the dust-laden air from the main separating-chamber A, and causes the same to enter the upper chamber, C at an angle and be deflected toward one side thereof, so that its whirling or gyrating motion may be continued therein and cause the heavier particles to be forced against its inner surface, where they are in proper position to pass back through the ends of said slot c¹¹ into said main chamber A. The contents of the hopper B are continuously discharged therefrom, and may be carried directly to the engine-room to be used as fuel or be carried or forced to a suitable place of deposit. By constructing our machine to have the operation as described, no back-pressure is created and friction is reduced to a minimum, and the oper-

ations of collecting and separating the dust from the dust-laden air are carried on simultaneously and effectually. The entire machine is convenient in transportation, as the parts may be readily separated and set up for use.

It is obvious that many minor details in the construction and arrangement of the parts could be made and substituted for those shown and described without in the least departing from the nature and principle of our invention.

We make no claim to the combination of the main separating-chamber and the cylindrical separating-chamber secured above the same and communicating therewith and provided with a pure-air-escape pipe having an opening and closing plate or cover.

Having thus described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. In a dust-collector, the combination, with a dust or separating chamber provided with an air-outlet at its top and with walls of varying inclines, of a hopper secured to the under side of said chamber and at one side of the center line thereof, and a chamber surrounding said air-outlet and having itself an outlet for the air freed from dust, substantially as described.

2. In a dust collector and separator, the combination of a spirally-arranged duct or pipe having sides or walls of varying inclines, a communicating hopper secured to the under side of said duct and at one side of the center line thereof, and a chamber above said duct, substantially as described.

3. In a dust collector and separator, the combination of a spirally-arranged pipe or duct having sides or walls of varying inclines, a bottom provided with openings and suitable deflectors arranged over said openings, and a hopper situated under said pipe or duct and at one side of the center line thereof, substantially as described.

4. In a dust collector and separator, the combination of a spirally-arranged duct having walls of varying inclines and an enlarged central portion, a hopper under the same and at one side of the center line thereof, and a short central pipe connecting the hopper and the said central portion of the duct, substantially as described.

5. In a dust collector and separator, the combination of a spirally-arranged duct having walls of varying inclines, a communicating hopper secured to the under side of said duct, and a cylindrical chamber above said duct provided in its bottom with a plate or disk formed with a slot extending across the same and with upwardly and downwardly bent edges along the sides of said slot, substantially as described.

6. In a dust collector and separator, the combination of a spirally-arranged duct having walls of varying inclines, a communicat-

ing hopper secured to the under side of said duct, a cylindrical chamber above said duct provided in its bottom with a plate or disk formed with a slot extending across the same and with upwardly and downwardly bent edges along the sides of said slot, and a dust-exit pipe secured to the upper side of said chamber and a pure-air-escape pipe secured to the upper end thereof, substantially as described.

7. In a dust collector and separator, the combination of the separating-chamber A, having the bottom a^2 , the hopper B, secured to and communicating therewith, the rectangular box A^3 , secured to said bottom and having one open end, and the short pipe A^2 , substantially as described.

8. In a dust collector and separator, the combination of the separating-chamber A, and the hopper B, communicating therewith, which is provided at its lower or discharge end with the pivoted door B' , the weighted arm $b'b^2$, and the fusible link b^3 , substantially as described.

9. In a dust collector and separator, the combination of a spirally-arranged duct having walls of varying inclines, a bottom provided with openings, and upwardly-curved deflectors arranged over portions of said openings, a hopper situated at one side of the central under portion of said duct, a chamber secured on top of said duct and provided in its bottom with a slotted plate or disk, and a pipe having an opening and closing cover or plate movably secured to said chamber, substantially as described.

10. In a dust collector and separator, the combination of a spirally-arranged pipe or duct forming the main portion of the machine, and having sides or walls of varying inclines arranged to form a circular or nearly circular chamber in the central internal portion of the said duct, the bottom having openings a^7 a^{11} and suitable upwardly-inclined curved deflectors arranged over said openings, a hopper secured to the under side of said duct and having an opening and closing door at its lower portion, a cylindrical chamber secured to the top portion of said duct, a dust-exit pipe secured to its upper side, a pure-air-escape pipe secured to the top portion of said chamber, and an opening and closing cover or plate, substantially as described.

11. In a dust collector and separator, the combination of a spirally-arranged duct or pipe having a bottom, a^2 , formed with elongated openings a^7 and a^{11} , and sides or walls of varying inclines, which form the duct wider at the bottom than at the top and being nearly circular in the central portion of the machine, a hopper secured to the under side of said duct and communicating through said elongated openings a^7 and a^{11} with the said duct, a pipe, A^2 , opening into the hopper from the central nearly circular portion, A' , of the machine, a metallic rectangular box having one open end secured on the under side of the

bottom a^2 , a cylindrical chamber above the
duct having a plate or disk formed with a slot,
and upwardly and downwardly bent edges
along said slot, a dust-exit pipe secured to
5 the cylindrical chamber at its uppermost side,
the pure-air-escape pipe on the top portion
thereof, and an opening and closing cover or
plate, substantially as described.

In testimony whereof we have affixed our
signatures in presence of two witnesses.

WILLIAM E. ALLINGTON.
WILLIAM H. CURTIS.

Witnesses:

D. K. SWARTWOUT,
F. E. MOORE.