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DEDUSTING APPARATUS

Filed June 30, 1930 4 Sheets-Sheet 1

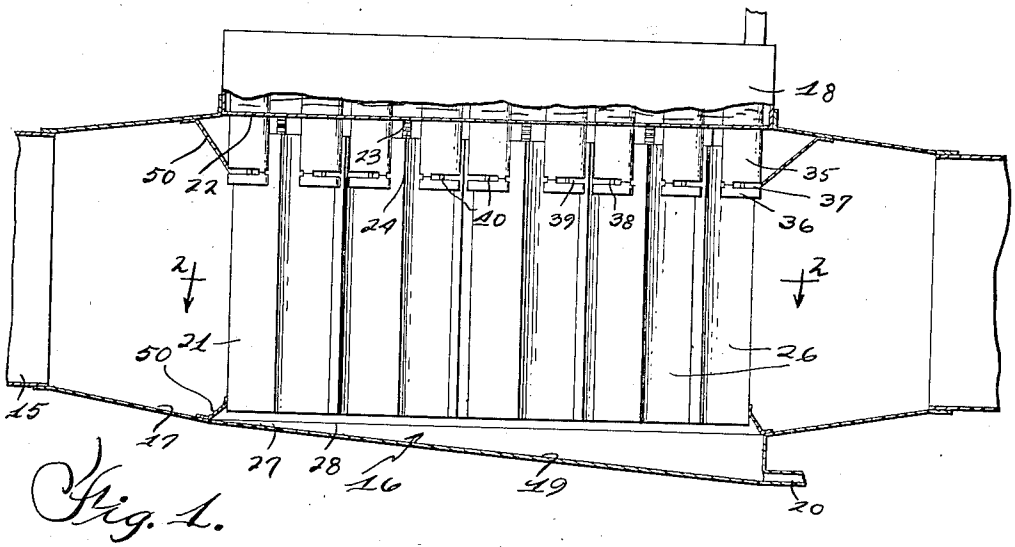

Fig. 1.

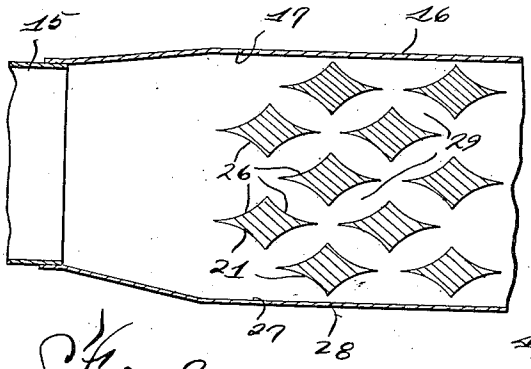

Fig. 2.

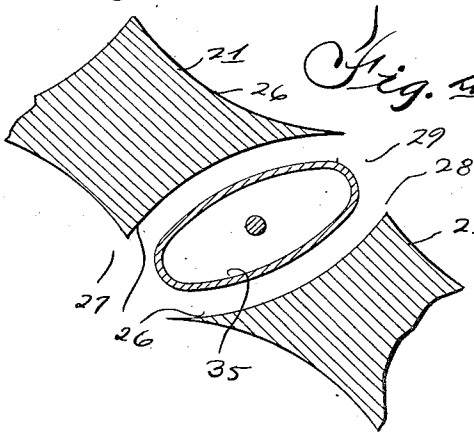

Fig. 4.

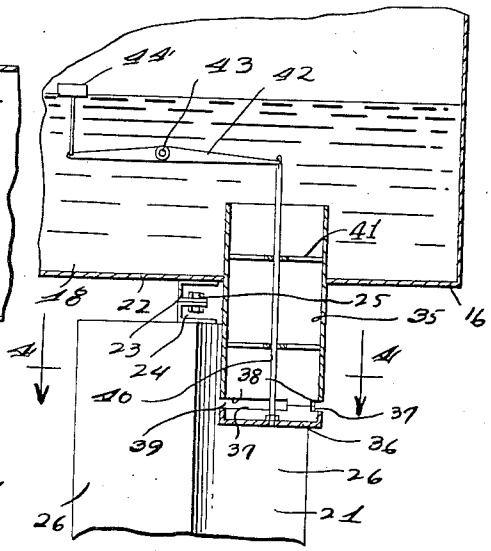

Fig. 3

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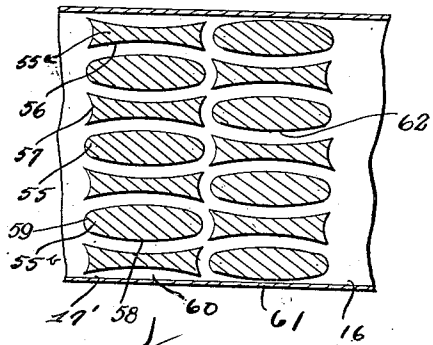

Fig. 5.

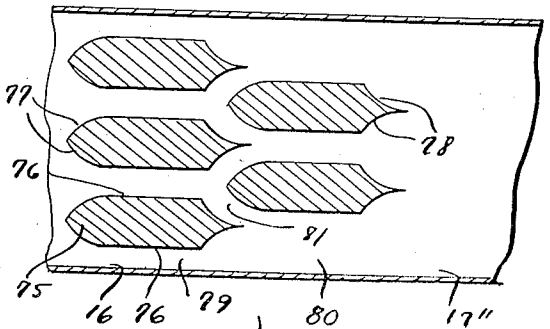

Fig. 7.

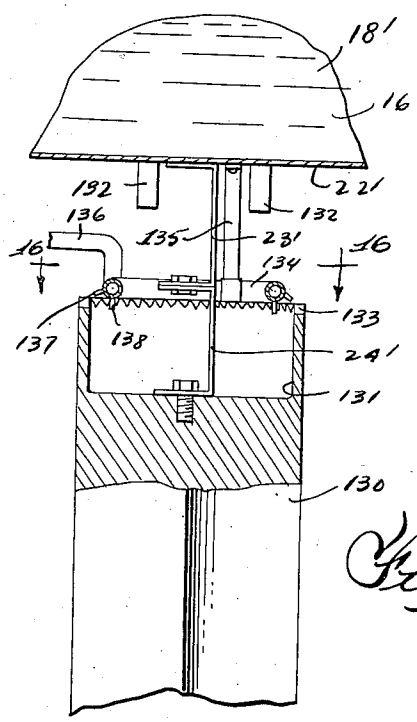

Fig. 15.

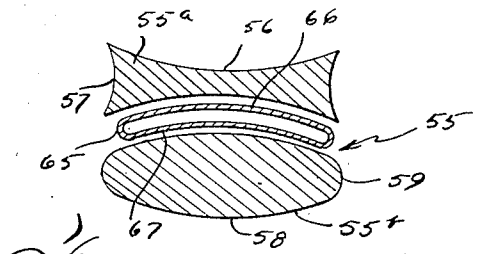

Fig. 6.

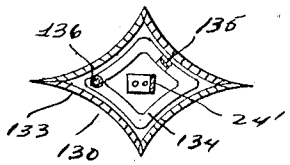

Fig. 16.

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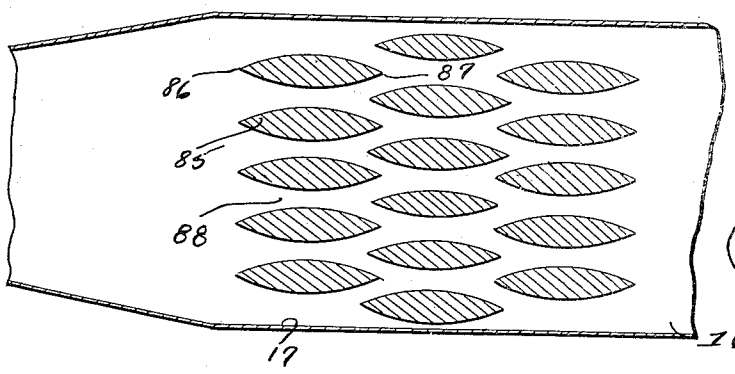

Fig. 8.

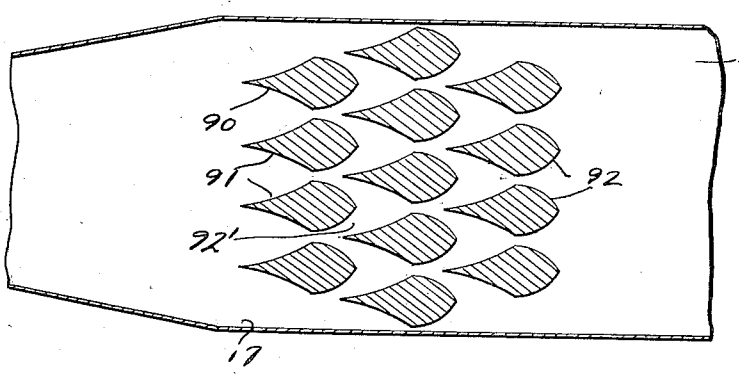

Fig. 9.

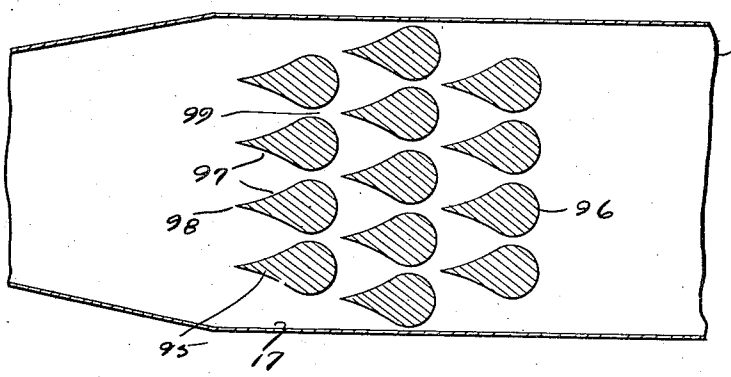

Fig. 10.

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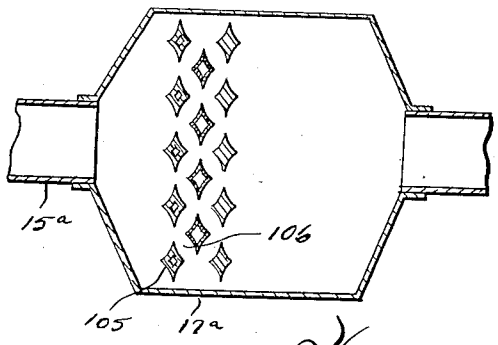

Fig. 11.

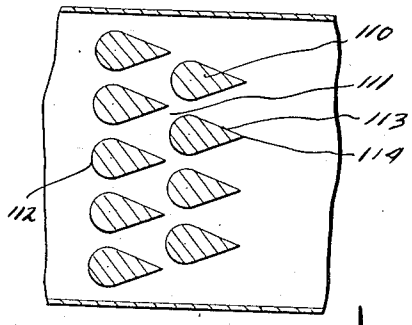

Fig. 12

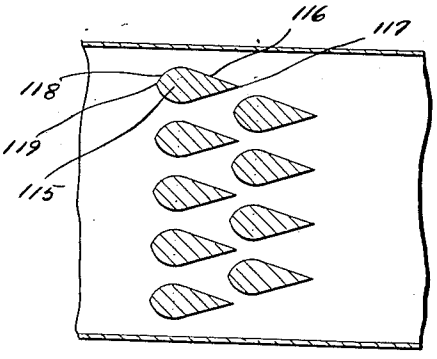

Fig. 13.

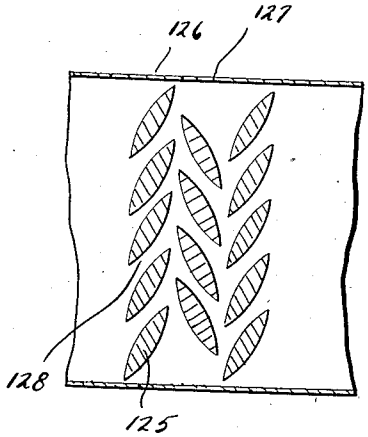

Fig. 14.

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UNITED STATES PATENT OFFICE

1,989,774

DEDUSTING APPARATUS

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Application June 30, 1930, Serial No. 464,986

10 Claims. (Cl. 183—21)

This invention relates to a de-dusting apparatus and has particular reference to an apparatus for removing dust and the like from a stream of flowing gas.

One of the primary objects of this invention is to provide a device of the above mentioned character in which elements having wetted surfaces are provided, these elements being of improved shape and arrangement.

Other objects and advantages of the invention will become more apparent as the following description proceeds, particularly when reference is had to the accompanying drawings, wherein:

Figure 1 is a vertical sectional view through an apparatus constructed in accordance with the teachings of this invention;

Figure 2 is a sectional view taken substantially on the line 2—2 of Figure 1;

Figure 3 is an enlarged sectional view through a portion of the structure shown in Figure 1;

Figure 4 is a sectional view taken substantially on the line 4—4 of Figure 3;

Figure 5 is a view similar to Figure 2 showing a slightly modified form of baffle element for use in the apparatus;

Figure 6 is a view similar to Figure 4 showing a slightly modified form of construction for wetting the surfaces of the baffle elements shown in Figure 5;

Figures 7 to 14 inclusive are views similar to Figure 2 showing still further forms and arrangements of baffle elements;

Figure 15 is a view similar to Figure 3 showing a slightly modified form of construction; and

Figure 16 is a sectional view taken substantially on the line 16—16 of Figure 15.

The present invention is directed particularly to that type of de-dusting apparatus in which baffle elements are arranged in the path of the gas to be cleaned. The invention contemplates in particular the provision of a novel baffle element which will be relatively thick, radially non-symmetrical in cross sectional shape, that is having a greater dimension in one direction than in another direction and preferably elongated in the direction of gas flow to provide an apparatus which will be relatively narrow. By the term "thick element" is meant an element of appreciable width whether the same be solid, cored out, formed of plates welded or otherwise fixed together, or otherwise formed, and has reference to the overall width rather than to any thickness of the material itself. The invention further contemplates the provision of means for wetting the surfaces of the baffle elements and an arrangement of these baffle elements in the gas passage in such a manner that the wetted surfaces thereof cooperate to form relatively narrow passages through which the gas must pass, which passages, however, will be of substantially constant cross section so that the gas may flow through the apparatus without any substantial loss of pressure due to turbulence. By the term "wetting" is meant applying a dust collecting substance to the surface.

Referring then particularly to the drawings wherein like reference characters designate corresponding parts throughout all views, the numeral 15 designates a gas passage adapted to receive gas from any source (not shown) and to discharge the same either to the atmosphere or to a point of use. Arranged in the gas passage and intermediate the ends of the same, is a de-dusting apparatus designated generally by the reference character 16, the arrangement being such that the gas must pass through the de-dusting apparatus before it is discharged from the passage 15. The de-dusting apparatus includes a casing 17 which is preferably provided at its top with a tank 18 for receiving a dust collecting fluid, and at its bottom with a sloping wall 19 and a discharge conduit 20 which may be suitably controlled by a valve (not shown). As illustrated in Figure 2 of the drawings, the casing 17 is preferably elongated and is relatively narrow. Positioned in the casing 17, in the path of the flow of gas through the same, are baffle elements 21. These elements may conveniently be suspended from the lower wall 22 of the tank 18 by U-shaped members 23 and 24, the former being welded or otherwise fixed to the bottom wall of the tank and the latter being similarly fixed to the tops of the baffle elements, these members being detachably connected to each other by suitable means such as the bolts 25. The baffle elements are thick members of elongated non-symmetrical cross sectional shape and may, as illustrated in Figure 2 of the drawings, be substantially diamond shape in cross section, with the sides of the elements shaped to form the curved surfaces 26.

The elements 21 may be arranged in rows 27 and 28 transversely of the gas passage with the elements in one row staggered relative to the elements in the next adjacent row so that the curved surfaces of the elements cooperate to form relatively narrow gas passages 29 through which the gas must pass in its travel through the casing.

The invention contemplates the provision of means for flowing a dust collecting fluid, which may for example be water, over the curved surfaces of the baffle elements and to accomplish

this, there may be provided, as shown in Figures 3 and 4 of the drawings, tubes 35 which are mounted in the bottom wall of the tank 18 and which project slightly above the bottom of the tank, to prevent dirt and sediment settling in the tank from clogging these tubes. Associated with these tubes are cup-shaped end members 36, the latter being provided in their upper edges with slots 37 which cooperate with similar slots 38 formed in the lower edges of the tubes, to provide nozzle openings 39 directed toward the sides of the baffle elements. The tubes and their associated end members are preferably so shaped as to conform to the curvature of the adjacent curved surfaces of the baffle elements, as clearly illustrated in Figure 4 of the drawings; so that the fluid flowing through the tubes and out the nozzle openings 39 will be discharged evenly against the curved surfaces of the baffle elements.

To provide means for flushing the nozzle openings 39 to clean the same, the members 36 may be carried by stems 40 slidably mounted in spiders 41 carried by the tubes 35, and these stems may in turn be connected to levers 42 pivotally mounted as at 43 within the tank. Floats 44 are connected to the free ends of the levers 42 and provide means for swinging the levers 42 about their pivots upon variations in the level of the fluid within the tank. Thus, if the nozzle openings become clogged and the fluid level rises within the tank, the floats 44 will be raised and will thus swing the levers 42 about their pivots to force the stems 40 downwardly and to thus force the members 36 away from the ends of the tubes. Obviously, this will result in an increase in the size of the nozzle openings which will permit the fluid to rush out these openings to effect a cleaning of the same.

The operation of the invention as thus far described is as follows. Gas flowing through the passage 15 will enter the front of the casing 17 and will be directed against the body portions of the baffle elements by suitable plates 50 arranged at the top and the bottom of the casing and adjacent the baffle elements. The gas will thus be compelled to contact intimately with the curved surfaces of the baffle elements and these surfaces will be wetted by the dust collecting fluid discharged from the nozzle openings 39 against the same. The dust laden fluid will be deposited in the base of the casing 17 and will be directed by the sloping wall 19 to the outlet 20, the discharge through this outlet being controlled by a suitable valve, not shown. Should the nozzle openings become clogged, the level of the fluid in the tank 18 will rise, thus effecting an actuation of the stems 40 to move the members 36 away from the discharge tubes and thus effect a flushing of the nozzle openings. The baffle elements being elongated in cross section permit the utilization of a relatively long and narrow casing 17, while the curved surfaces of the baffle elements permit passage of the gas through the casing without creating an unusual degree of turbulence in the gas.

In Figure 5 a slightly modified form of baffle element 55 is disclosed which may be substituted for the diamond shaped baffle element shown in Figure 2. The baffle elements 55 are members having substantially oblong cross sectional shapes, certain of the elements having concave exterior surfaces and other of the baffle elements having convex exterior surfaces. Thus, the baffle elements 55^a are provided with the concave side faces 56 and the concave end faces 57, while the baffle elements 55^b are provided with the convex side faces 58 and the convex end faces 59. The elements may be arranged transversely of the gas passage in rows 60 and 61, each row being made up of alternate elements 55^a and 55^b. Thus, in row 60, the first element at the top is provided with concave exterior surfaces, while the next adjacent element in the same row is provided with convex exterior surfaces. The elements in the next transverse row may also be alternately convex and concave with, however, the convex elements in this row in longitudinal alignment with the concave elements in the next adjacent row. Thus, the curved surfaces of each element cooperate with the curved surfaces of the adjacent elements to provide passages 62 of constant cross section throughout the casing 17'.

For wetting the curved surfaces of the baffle elements 55, tubular members 65 may be provided, one of these members being arranged between each pair of baffle elements in the same manner as are the tubular members 35. It will be understood that the tubular members 65 are closed at their ends by cup-shaped members similar to the members 36 and it will be noted that each tubular member 65 is provided with a convex side 66 which is positioned adjacent the concave surface of one baffle element and that each tubular member is further provided with a concave side 67 which is positioned adjacent the convex surface of a baffle element. Thus, the liquid discharged from the tubular member 65 will be distributed in the form of a film over the curved surfaces of the baffle elements 55.

It will be understood that the gas flowing through the casing 17' will be compelled to flow through the passages 62 and will thus contact intimately with the curved surfaces of the baffle elements 55. The dust and other objectionable elements in the gas will be removed by the film of fluid flowing down the curved surfaces of the baffle elements and will be collected in the bottom of the casing 17'.

In Figure 7 a further modified form of baffle element is shown and by reference to this figure, it will be noted that the baffle elements 75 are polygonal in cross sectional shape and that each element is provided with two elongated flat sides 76, two convex short sides 77, forming one end, and two concave short sides 78, forming the other end. The baffle elements may be arranged in rows 79 and 80 transversely of the casing 17'' with the elements in each row staggered relative to the elements in the next adjacent row and with the convex curved ends of all of the elements facing the gas flow. Thus, the convex ends of the elements in row 80 will be arranged between the concave ends of the elements in row 79 so that all of the baffle elements will cooperate to form passages 81 of substantially constant cross sectional area through which the gas must flow in its passage through the casing. It will be noted that the elements 75 are elongated and thus permit the utilization of a relatively long and narrow de-duster casing and it will be clearly apparent that the surfaces of these baffle elements may be wetted in any desired manner as, for example, the manner previously described.

In Figure 8 a further modified form of construction is shown in which the baffle elements 85 are substantially oval in cross sectional shape. As illustrated, these elements are preferably provided with the knife edges 86 and the convexly curved sides 87. The elements may be arranged in rows transversely of the casing with the ele-

ments in each row staggered relative to the elements in the next adjacent row so that the curved surfaces of the elements cooperate to form passages 88 through which the gas must flow. It will be understood that these elements may be arranged in the manner illustrated or in any other desired manner within the gas passage and that the curved surfaces of these elements may be wetted in any desired manner.

In the form of invention shown in Figure 9, baffle elements 90 are illustrated as being substantially diamond shaped in cross section but as having the concave sides 91 and the convex sides 92. These elements may be arranged in rows transversely of the casing with the elements of each row staggered relative to the elements of the next adjacent row to provide passages 92' through which the gas must flow. As illustrated, these elements are preferably so arranged that their longer cross sectional axes are in the direction of gas flow and it will be understood that the curved exterior surfaces of these elements may be covered with a film of dust collecting fluid in any desired manner.

In Figure 10 a construction is shown in which elements 95 are arranged in rows transversely of the casing with the elements in each row staggered relative to the elements in the next adjacent row. Each element 95 is substantially pear-shaped in cross section, being provided with the convexly rounded end 96 and the substantially concave sides 97 which unite at one end of the element to form the knife edge 98. The elements are so arranged that passages 99 are formed through which the gas must travel. It will be noted that, as illustrated, these elements are elongated in cross sectional shape in the direction of gas flow, and it will be understood that these elements may be arranged in any desired manner within the gas passage.

In Figure 11 a further modified form of construction is disclosed in which the casing 17^a is shown as being relatively wide as compared to the gas passage 15^a. It will be noted that in this form of construction, however, the casing is relatively short as compared to the casings in the forms previously described. Arranged in the casing 17^a are baffle elements 105 which are similar in construction to the baffle elements 21 shown in Figure 2 of the drawings. These elements may be arranged in rows transversely of the casing with the elements in each row staggered relative to the elements in the next adjacent row to provide passages 106 through which the gas must pass in its travel through the casing. While the elements in this form are shown as being substantially diamond shaped in cross section and as being provided with curved exterior surfaces it is to be clearly understood that these elements may be of any desired shape and may be formed either solid, cored out or of flat plates secured together in any desired manner. It will be noted, however, that the elements instead of being arranged with their longer axes in the direction of gas flow are arranged with their longer axes crosswise of the casing, thus facilitating the utilization of a wide casing which, however, will be relatively short as compared to the casings utilized with the forms of baffle elements previously described.

In Figure 12 a construction is shown in which baffle elements 110 are arranged in rows transverse of the casing. The elements in each row are staggered relative to the elements in the next adjacent row to provide passages 111 through which the gas must pass. The elements 110 are shown as being formed with rounded ends 112 facing the gas flow and flat sides 113 which extend from the rounded ends to the rear of the element where they meet to form a knife edge 114. It will be understood that the elements 110 may be formed in any desired manner and that the surfaces of these elements may be covered in any desired manner by a film of dust collecting fluid.

In Figure 13 elements 115 are shown which are similar to the elements 110 in that each element is provided with the flat sides 116 which are united at the rear of the element to form a knife edge 117. The forward end of each element is provided with the two curved surfaces 118 which meet at the front of the element to form a relatively sharp edge 119. These elements may be arranged in rows transversely of the casing as illustrated, with the elements in each row staggered relatively to the elements in the next adjacent row to provide gas passages through which the gas must travel.

In Figure 14 there is disclosed a construction in which elements 125 similar to the elements 85 are shown as being arranged diagonally of the casing. It will be noted that the elements are arranged in rows 126 and 127 transversely of the casing and are inclined toward the sides of the casing. Further the elements in row 127 are staggered and disposed angularly relative to the elements in row 126. Thus alternate rows of the elements are oppositely inclined so that interrupted passages 128 are formed within the casing for the passage of the gas. It is to be understood that the curved surfaces of these elements may be wetted in any desired manner to effect a removal of the dust from the gas.

In Figures 15 and 16 a slightly modified form of construction for wetting the surfaces of the baffle elements is disclosed. Referring to these figures, it will be noted that there is disclosed a baffle element 130 which may be of any desired cross sectional shape. The baffle element is supported from the lower wall 22' of the liquid tank 18' by members 23' and 24'. The baffle element is, however, provided in its upper end with the recess 131 adapted to be supplied with water or other dust collecting fluid from the tank 18' by nozzles 132. When the element is cored out or formed of plates fixed together this recess may be formed by fixing a cup-shaped member or the like in the top of the element. The upper end of the element is provided with the saw teeth 133 so that when the recess 131 becomes filled with water, this water will flow between the saw teeth 133 and down over the exterior surfaces of the baffle element.

To prevent the spaces between the saw teeth from becoming clogged with sediment or the like, a conduit 134 may be located adjacent the top of the baffle element, this conduit being supported from the base of the tank by suitable brackets 135. A fluid under pressure may be supplied to the conduit 134 by a supply pipe 136 and the conduit is provided with nozzles 137 and 138 for directing this fluid under pressure toward the spaces between the saw teeth and toward the bottom of the recess, respectively. The arrangement is such that whenever the recess 131 or the spaces between the saw teeth become clogged with dirt or the like, a fluid under pressure may be supplied to the conduit 134 and may be discharged from this conduit toward these portions of the baffle element to effect a cleaning of the same.

From the above it will be noted that the invention provides a de-dusting apparatus in which baffle elements of appreciable width are used. These baffle elements may be solid members, solid members cored out in the manner illustrated, members formed of a plurality of plates fixed together, or members formed in any other desired manner. The elements are oblong or elongated in cross sectional shape and are arranged in the de-duster casing with their longer axes either crosswise, lengthwise or diagonally of the casing. The elements are provided with curved, or curved and flat exterior surfaces and are so arranged that these exterior surfaces cooperate to form passages through which the gas must travel. These surfaces of the elements are adapted to be covered by a film of dust collecting fluid so that the dust carried by the gas passing through the casing will be collected by this fluid and discharged from the casing.

While several forms of the invention have been described with considerable detail, it is to be understood that the description is for the purposes of illustration only and that the right is reserved to make such changes in the details of construction and arrangement of parts as will fall within the purview of the attached claims.

What I claim as my invention is:

1. In an apparatus for removing dust from gases, a chamber, a fluid tank carried by said chamber, a baffle element of appreciable width in said chamber, said baffle element being of elongated cross sectional shape and being provided with curved surfaces, means for continuously flowing a fluid from said tank over the curved surfaces of said baffle element, and means for flushing said fluid flowing means.

2. In combination, a gas passage, a pair of baffle elements in said gas passage, said baffle elements being provided with adjacent curved surfaces, and a fluid discharge nozzle arranged between said baffle elements, said fluid discharge nozzle being provided with curved sides conforming to the curvature of the adjacent surfaces of said baffle elements.

3. In combination, a gas passage, a pair of baffle elements in said gas passage, said baffle elements being of elongated cross sectional shape and being provided with concave exterior surfaces, and a fluid distributing nozzle arranged between said baffle elements, said nozzle being provided with convex surfaces complementary to the concave surfaces of the baffle elements between which it is located.

4. In combination, a gas passage, and a plurality of baffle elements in said gas passage, all of said baffle elements being of elongated cross sectional shape, certain of said baffle elements being provided with convex exterior surfaces and others of said baffle elements being provided with concave exterior surfaces, said baffle elements being arranged within said passage with the concave surfaces of the first mentioned elements adjacent to the convex surfaces of the last mentioned elements and fluid discharge nozzles arranged between said baffle elements, each discharge nozzle being provided with concave and convex surfaces respectively adjacent the convex and concave surfaces of said elements.

5. In an apparatus of the class described, a baffle element having a recess in its upper end, means for supplying a fluid to said recess whereby said recess may be overflowed to wet the surfaces of said element, and means for flushing said recess to cleanse the same.

6. In an apparatus of the class described, a baffle element provided with a recess in its upper end, the upper edge of said element being serrated whereby a fluid supplied to said recess may flow between the serrations and downwardly over the sides of the element, means for supplying a fluid to said recess, and means for flushing said recess and the spaces between the said serrations.

7. In combination, a gas passage, a plurality of baffle elements disposed in said gas passage, all of the surfaces of certain of said baffle elements being concave and all of the surfaces of the remaining of said elements being convex, said baffle elements being so arranged that the convex surfaces of the first mentioned elements are adjacent the concave surfaces of the second mentioned elements whereby said elements cooperate to form passages of substantially constant cross sectional area through which the gas must flow.

8. In an apparatus of the class described, a baffle element, means for flowing a fluid over the exterior surfaces of said baffle element, and means for discharging a fluid under pressure adjacent said flowing means to cleanse the same.

9. In an apparatus of the class described, a baffle element having a recess in its upper end, means for supplying a fluid to said recess whereby said recess may be overflowed to wet the surfaces of said element, and means for discharging a fluid under pressure adjacent said recess to cleanse the same.

10. In an apparatus of the class described, a baffle element, means associated with the upper end of said element for flowing a fluid over the surfaces of said element, and auxiliary fluid supply means for cleansing said first mentioned means.

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