

Aug. 15, 1933.

H. E. BRELSFORD

1,922,075

DEDUSTING APPARATUS

Filed April 20, 1931

2 Sheets-Sheet 1

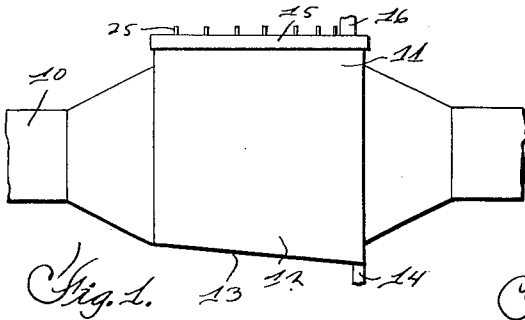


Fig. 1.

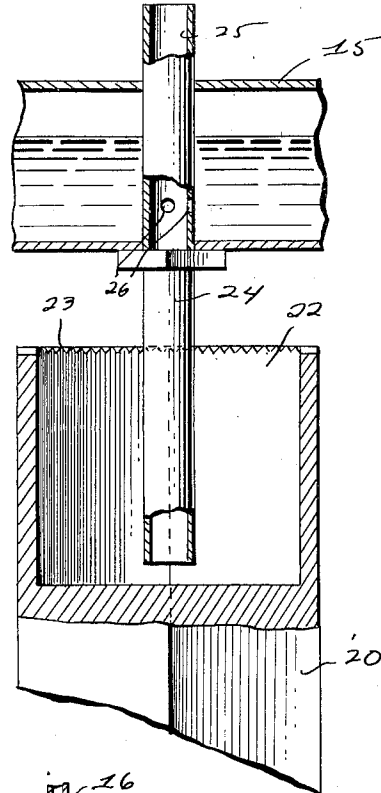


Fig. 4.

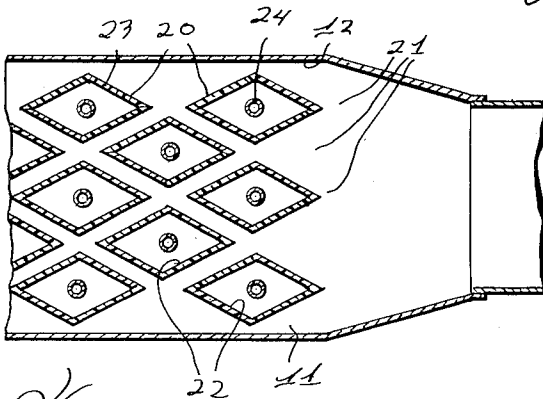


Fig. 3.

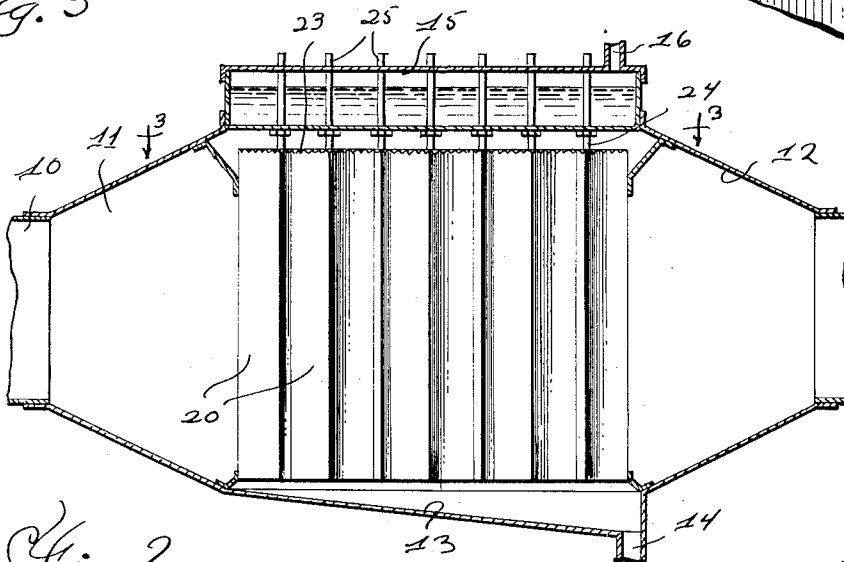


Fig. 2.

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2 Sheets-Sheet 2

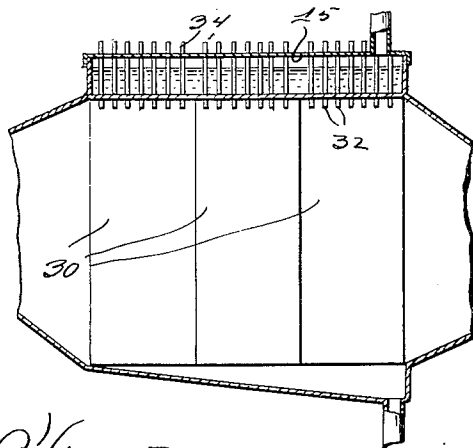


Fig. 5.

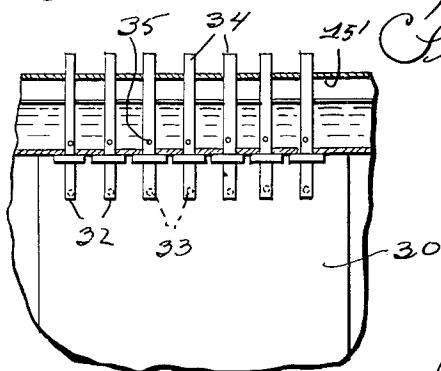


Fig. 6.

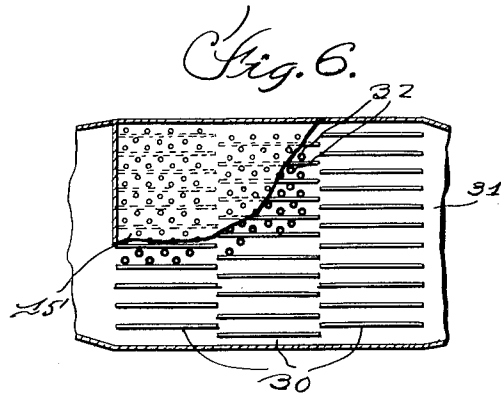


Fig. 7.

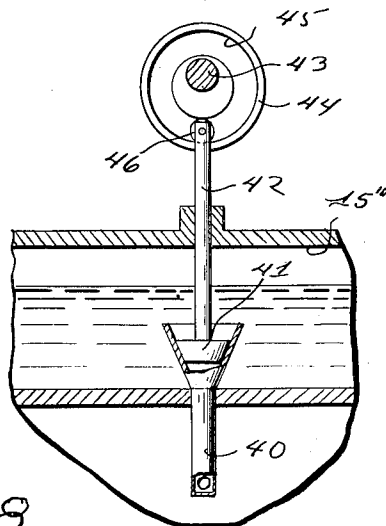


Fig. 8.

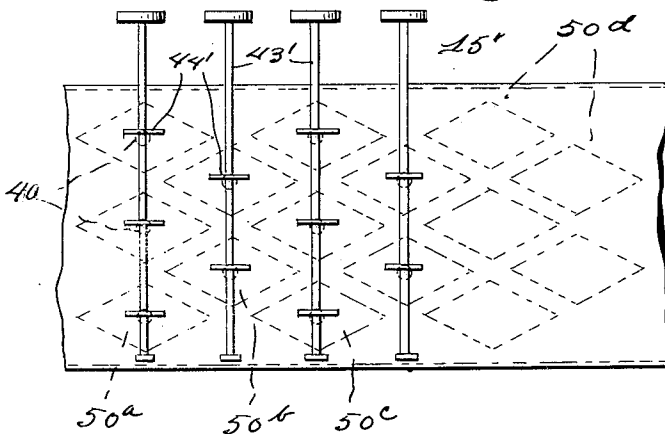


Fig. 9.

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1,922,075

DEDUSTING APPARATUS

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Application April 20, 1931. Serial No. 531,571

18 Claims. (Cl. 183—21)

This invention relates to an apparatus for removing dust and other objectionable elements from a stream of flowing gas and has particular reference to an apparatus of this character in which wetted elements are placed in the path of gas flow for separating the dust and other objectionable elements from the gas.

One of the primary objects of this invention is to provide means for evenly distributing the water or other liquid over the surfaces of the elements arranged in the path of gas flow.

A further object of this invention is to provide means for periodically flushing the surfaces of the elements to maintain these surfaces wet and to periodically wash the dust or the like from the same. The invention further contemplates the provision of a construction in which the water or other liquid used for wetting the surfaces of the elements will not be blown through the de-dusting apparatus and contemplates further the provision of a construction by which the frequency of the flushing of the elements and the amount of liquid flowed over the surfaces of the elements may be readily controlled.

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

Fig. 1 is an elevational view of a de-dusting apparatus constructed in accordance with the teachings of this invention, this apparatus being shown in position in a gas passage;

Fig. 2 is a vertical sectional view through the de-dusting apparatus shown in Fig. 1;

Fig. 3 is a horizontal sectional view taken substantially on the line 3—3 of Fig. 2;

Fig. 4 is an enlarged sectional view through a portion of the structure shown in Fig. 2;

Fig. 5 is a view similar to Fig. 2 showing a slightly modified form of construction;

Fig. 6 is a horizontal sectional view through the device shown in Fig. 5;

Fig. 7 is an enlarged elevational view of a portion of the structure shown in Fig. 5;

Fig. 8 is a fragmentary elevational view showing a further modified form of construction; and

Fig. 9 is a semi-diagrammatic plan view with parts broken away showing a further application of the inventive idea.

Referring then more particularly to the drawings wherein like reference characters designate corresponding parts throughout all views, there is shown in Fig. 1 a gas passage 10 adapted to

receive the waste gases from a furnace or any other dust originating apparatus (not shown) and adapted to conduct this gas to the atmosphere or to any other point of discharge. Arranged intermediate the ends of this passage is a device 11 adapted to remove the dust and other objectionable elements from the gas prior to its discharge from the passage.

The device 11 may be of any general construction in so far as it includes one or more elements arranged in the path of gas flow, together with means for wetting the surfaces of these elements. Thus, by reference to Figs. 2 and 3 of the drawings, it will be noted that the device may include a casing 12 having inlet and outlet ends connected to adjacent portions of the gas passage 10. The casing is provided with a sloping lower wall 13 for directing the dust laden liquid to a discharge pipe 14 and is provided adjacent its top with a tank 15 adapted to be supplied with water or any other dust collecting liquid as by the pipe 16.

Arranged within the casing 12 in the path of the gas flow therethrough are a plurality of elements 20. These elements may be of any desired cross sectional shape and are shown, by way of illustration, in Fig. 3 of the drawings as being substantially diamond shaped in cross section. Further, these elements may be arranged in any desired manner within the casing but are preferably arranged in transverse rows 21, the elements in each row being staggered relative to the elements in the next adjacent rows.

For the purpose of wetting the outer surfaces of these elements, each element may be provided adjacent its upper end with a recess 22, the upper edge of the element defining the top of the recess being serrated as designated by the reference character 23. A nozzle pipe 24 extends downwardly a substantial distance into each recess for discharging liquid into the same, the arrangement being such that when the recess is overflowed, the liquid will run downwardly over the exterior surfaces of the element to wet the same.

The present invention contemplates means for causing the liquid to flow over the surfaces of the elements in a series of waves and each nozzle pipe 24 is therefore extended upwardly through the tank 15 so that its inlet end 25 is placed in communication with the atmosphere. Within the tank each nozzle pipe is provided with one or more openings 26 through which the liquid in the tank may flow for discharge into the recess 22. It will be noted that the openings 26 are spaced

above the floor of the tank so that the same will not be clogged by dirt or the like collecting in the bottom of the tank.

By this arrangement air will be entrained with the liquid in the nozzle pipe 24 and a mixture of air and water will be discharged into each recess 22. The air being discharged into the recess 22 at a substantial distance below the level of the liquid therein will bubble upwardly through the liquid and create a considerable disturbance over the entire surface of the liquid. This disturbance or boiling of the liquid will cause the same to flow intermittently between the teeth of the serrated edge 23 of the baffle element with the result that the liquid will flow intermittently or in waves down the sides of the element. Generally, the entire surface of the liquid will be disturbed by the bubbling of the air up through the liquid and the liquid will be discharged evenly from the top of the recess and distributed evenly over the sides of the element. However, any other distribution of the liquid may be effected as desired by properly controlling the disturbance of the liquid by the air.

As brought out before, the shape of the elements within the de-duster casing may be varied at will. Thus, in place of the elements of substantial thickness above described, plate-like elements 30, such as shown in Figs. 5 and 6 of the drawings, may be arranged within the casing. These elements are preferably arranged in transverse rows 31, the elements of each row being staggered relative to the elements of the next adjacent rows so that the gas flowing through the casing is divided into a number of relatively fine bands.

For the purpose of wetting the outer surfaces of these plate-like elements, a plurality of nozzle pipes 32 are associated with each element, these nozzle pipes having their lower discharge ends 33 arranged adjacent the upper edge of the element, as clearly shown in Fig. 7 of the drawings. Each nozzle pipe extends into the liquid tank 15' and is provided with an inlet end 34 in communication with the atmosphere and an inlet port 35 through which liquid may flow from the tank 15'. Thus a mixture of air and water will be discharged from each nozzle pipe adjacent the top of its respective element.

With this arrangement the dust collecting liquid will be intermittently discharged from each nozzle pipe, the air entrained with the liquid causing this intermittent discharge. Thus the dust collecting liquid will be flowed down the sides of the elements in a series of waves with the result that the surfaces of the elements will be continuously wetted but will be periodically flushed by the liquid. As in the first described form of construction, this flushing of the surfaces of the elements effects a washing of the dust and other objectionable elements from the same.

If desired, mechanical means may be provided for effecting an intermittent discharge of the dust collecting liquid over the surfaces of the elements. Such a means is shown in Fig. 8 of the drawings and by reference to this figure, it will be noted that each discharge pipe 40 is connected to the bottom wall of the liquid tank 15'. A valve 41 within the tank is adapted to close the end of the nozzle pipe 40 to prevent the flow of liquid from the tank through this pipe and a valve stem 42 is connected to this valve for operating the same. To reciprocate the valve stem

and thus periodically open and close the valve, there is provided a shaft 43 which may be rotated in any desired manner. Fixed to this shaft is a disk 44 provided with a cam groove 45 adapted to receive a roller 46 journaled on the end of the valve stem. Thus, as the shaft 43 is rotated the valve stem 42 will be vertically reciprocated and the valve 41 will be periodically opened and closed to effect an intermittent supply of liquid from the tank 15' to the pipe 40. It will be understood that the pipe 40 might be associated with the baffle element shown in Fig. 4 of the drawings or with the baffle element shown in Fig. 7. If the pipe 40 is arranged to discharge the dust collecting liquid into a reservoir or recess at the top of the baffle element in the manner illustrated in Fig. 4, then the intermittent supply of liquid to this recess will effect an intermittent overflow of the liquid from the recess as will be readily apparent. If, on the other hand, the pipe 40 is arranged to discharge the dust collecting liquid directly against the outer surface of an element in the manner disclosed in Fig. 7, then the intermittent supply of liquid to the pipe will effect an intermittent flow of the dust collecting liquid down the sides of the element as will be readily apparent.

The mechanical means for effecting an intermittent flow of the dust collecting liquid has particular advantages when it is desired to regulate the quantity of liquid flowed over the surfaces of the elements or the periods of flushing of the elements. Thus, as diagrammatically illustrated in Fig. 9 of the drawings, with the elements arranged in rows 50 transversely of the de-duster casing, the shafts 43' may be so rotated and the cam disks 44' so arranged on these shafts that the rows of baffle elements will be flushed in sequence. Thus the baffle elements in row 50^a may be flushed slightly in advance of the baffle elements in row 50^b and these latter may be flushed slightly in advance of the elements in row 50^c. Further, the speed of rotation of the shafts may be varied so that the elements in one row will be flushed with less frequency than the elements in another row, with the result that certain rows of the elements will be wetted to a lesser extent than the elements in other rows. This latter provision eliminates the danger of the dust collecting liquid being blown through the de-duster casing by the force of the gas being cleaned, since, while the elements in row 50^a may be frequently flushed and thus wetted to a considerable extent, the elements in rows 50^b and 50^c may be less frequently wetted and may thus collect any dust collecting liquid blown off of the elements 50^a. Further, if desired, certain of the rows of elements adjacent the discharge end of the casing may be maintained free from the dust collecting liquid and being thus substantially dry, will collect any moisture blown off of the preceding elements in the casing. Thus the arrangement might be such that no dust collecting liquid would be supplied to the elements in rows 50^d with the result that any liquid blown from the rows 50^a, 50^b or 50^c would be collected by the elements in rows 50^d.

From the above it is believed that the invention will be clearly apparent. Means is provided for effecting an intermittent flow of a dust collecting liquid over the surfaces of the elements arranged in the path of the gas flow and this intermittent flow of the liquid maintains the surfaces wet and also periodically flushes the sur-

faces to wash the dust and the like therefrom. The intermittent flow may be effected by the entrainment of air or any other gas with the dust collecting liquid or may be effected by mechanically actuating a valve which controls the flow of liquid to the surfaces. Further, the flowing of the liquid in waves or intermittently will effect a thorough wetting of the surfaces without, however, so flooding the surfaces that the liquid will be blown from the same.

While several forms of the invention have been disclosed and described, it is to be understood that the right is reserved to make all such changes in the details and arrangement of parts as will fall within the purview of the attached claims.

What I claim as my invention is:

1. In combination, a gas passage, an element in said passage in the path of the gas flow there-through, and continuously operating means for effecting a wave-like flow of a dust collecting liquid over said element.

2. In combination, a gas passage, an element in said gas passage in the path of the gas flow there-through, a source of dust collecting liquid, and means for causing the liquid from said source to flow over said element in a series of waves.

3. In combination, a gas passage, an element in said gas passage in the path of the gas flow there-through, and means for supplying a liquid to the surface of said element to wet the same, including means for introducing a gas into said liquid to cause the liquid to flow over the surface of said element in a series of waves.

4. In combination, a gas passage, an element in said passage in the path of the gas flow there-through, and means including a nozzle pipe for flowing a liquid over said element to wet the same, including means for entraining air with the liquid in said nozzle pipe to cause the liquid to flow in waves over said element.

5. In combination, a gas passage, an element in said passage in the path of the gas flow there-through, and means for intermittently flowing a liquid over said element to wet the same, said means including a liquid tank and a nozzle pipe extending into said tank, said nozzle pipe having its discharge end adjacent said element and its inlet end open to the atmosphere, said nozzle pipe being also provided with an opening intermediate its ends constituting an inlet for the liquid in said tank.

6. In combination, a gas passage, an element in said passage in the path of the gas flow there-through, a nozzle pipe having a discharge end adjacent said element, and means operating to intermittently supply a liquid to said nozzle pipe for discharge therefrom on to said element to cause the liquid to flow over said element in a series of waves.

7. In combination, a gas passage, an element in said passage in the path of the gas flow there-through, said element being provided with a recess adjacent its upper end, means for supplying a liquid to said recess, and means for causing the liquid in said recess to flow therefrom in a series of waves down the sides of said element.

8. In combination, a gas passage, an element in said passage in the path of the gas flow there-through, said element being provided with a recess adjacent its upper end, and means for supplying a liquid to said recess and for discharging a gas into said liquid to cause the same to bubble over the edge of said recess and flow down the sides of said element.

9. In combination, a gas passage, an element in said passage in the path of the gas flow there-through, said element being provided with a recess adjacent its upper end, and means for filling said recess with a liquid and for causing the said liquid to intermittently flow over the edges of said recess and down the sides of said element, said means including a liquid tank, and a nozzle pipe having its discharge end in said recess adjacent the lower end thereof and having its inlet end in communication with the atmosphere, said nozzle pipe being also provided with an opening intermediate its ends constituting an inlet for the liquid in said tank.

10. In combination, a gas passage, an element in said passage in the path of the gas flow there-through, said element being provided with a recess adjacent its upper end, and means for supplying a liquid to said recess and for periodically causing the same to overflow said recess to wet the sides of said element, said means including a liquid discharge pipe extending into said recess, and means for admitting a gas to said nozzle pipe for discharge into said recess.

11. In combination, a gas passage, an element in said passage in the path of the gas flow there-through, and means for effecting a flow of a liquid over the surfaces of said element in a series of waves, said means including a liquid discharge pipe, and a valve for controlling the flow of liquid through said pipe.

12. In combination, a gas passage, an element in said passage in the path of the gas flow there-through, and means for effecting a flow of a liquid over the surfaces of said element in a series of waves, said means including a liquid discharge pipe, a valve for controlling the flow of a liquid into said discharge pipe, and means for periodically actuating said valve.

13. In combination, a gas passage, an element in said passage in the path of the gas flow there-through, and means for intermittently wetting the surfaces of said element, said means including a liquid discharge pipe, a valve for controlling the flow of a liquid through said pipe, a stem connected to said valve, a rotatable shaft, a disk carried by said shaft and having a cam groove, and a roller on said stem engageable in said cam groove whereby upon rotation of said shaft said stem is reciprocated to intermittently open and close said valve.

14. In combination, a gas passage, a plurality of elements arranged in rows transversely of said gas passage, means for wetting the surfaces of said elements, and means operating to flush the surfaces of said elements according to a predetermined desired sequence.

15. In combination, a gas passage, a plurality of elements arranged in rows transversely of said gas passage, and means operating to intermittently flush the surfaces of the said elements to wet the same and to wash the dust and other objectionable elements from the same, said means being operable to flush the elements in each row in advance of the elements of the next adjacent row in the direction of gas flow through the said passage.

16. In combination, a gas passage, an element in said passage in the path of the gas flow there-through, and means for intermittently flowing a liquid over said element to wet the same, said means including a liquid tank above said element, and a nozzle pipe extending into said tank through the floor thereof, said nozzle pipe having its discharge end adjacent said element and hav-

ing an inlet port within said tank and spaced a substantial distance above the floor thereof whereby liquid within said tank may flow through said opening and into said nozzle pipe said nozzle pipe having an open inlet end in communication with a source of gas.

17. In combination, a gas passage, an element in said passage in the path of gas flow there-through, and means operating to constantly

maintain a series of waves of a liquid on the surfaces of said element.

18. In combination, a gas passage, an element in said passage in the path of the gas flow there-through, and means operating to maintain a flow of a liquid over said element in the form of a series of waves.

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