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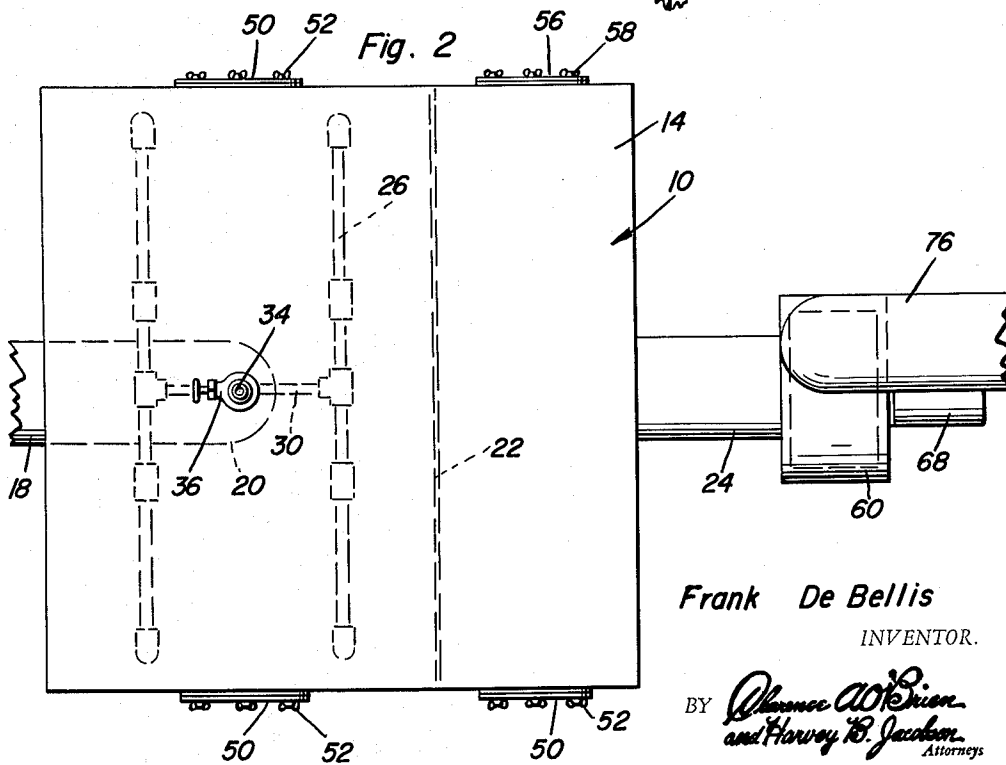
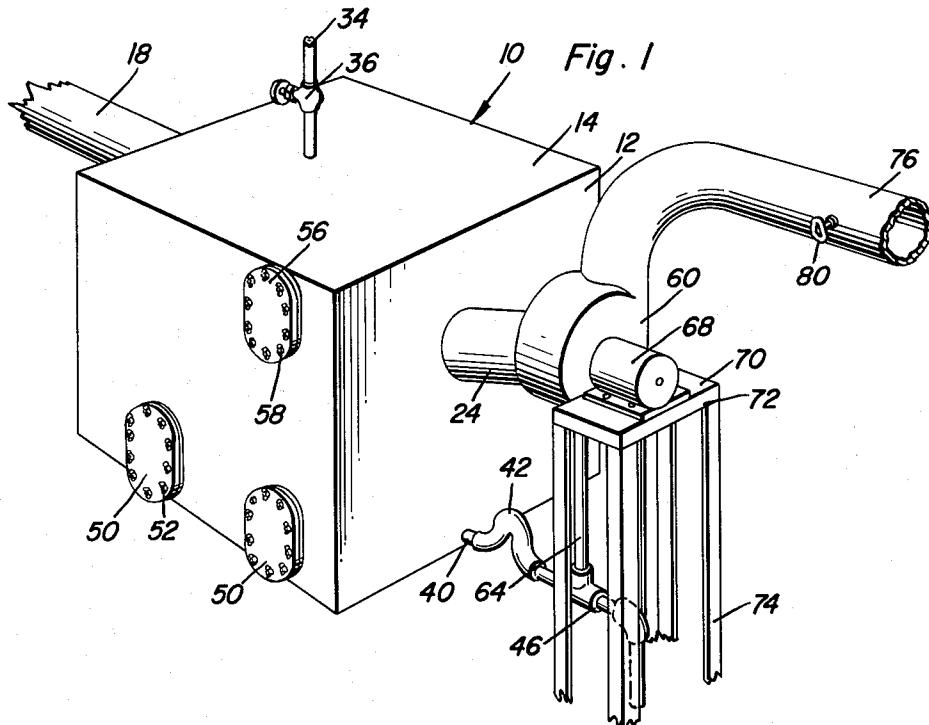
F. DE BELLIS

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SMOKE WASHER

Filed March 5, 1964

2 Sheets-Sheet 1



Frank De Bellis
INVENTOR.

BY *Charles A. O'Brien*
and *Harvey B. Jacobson*
Attorneys

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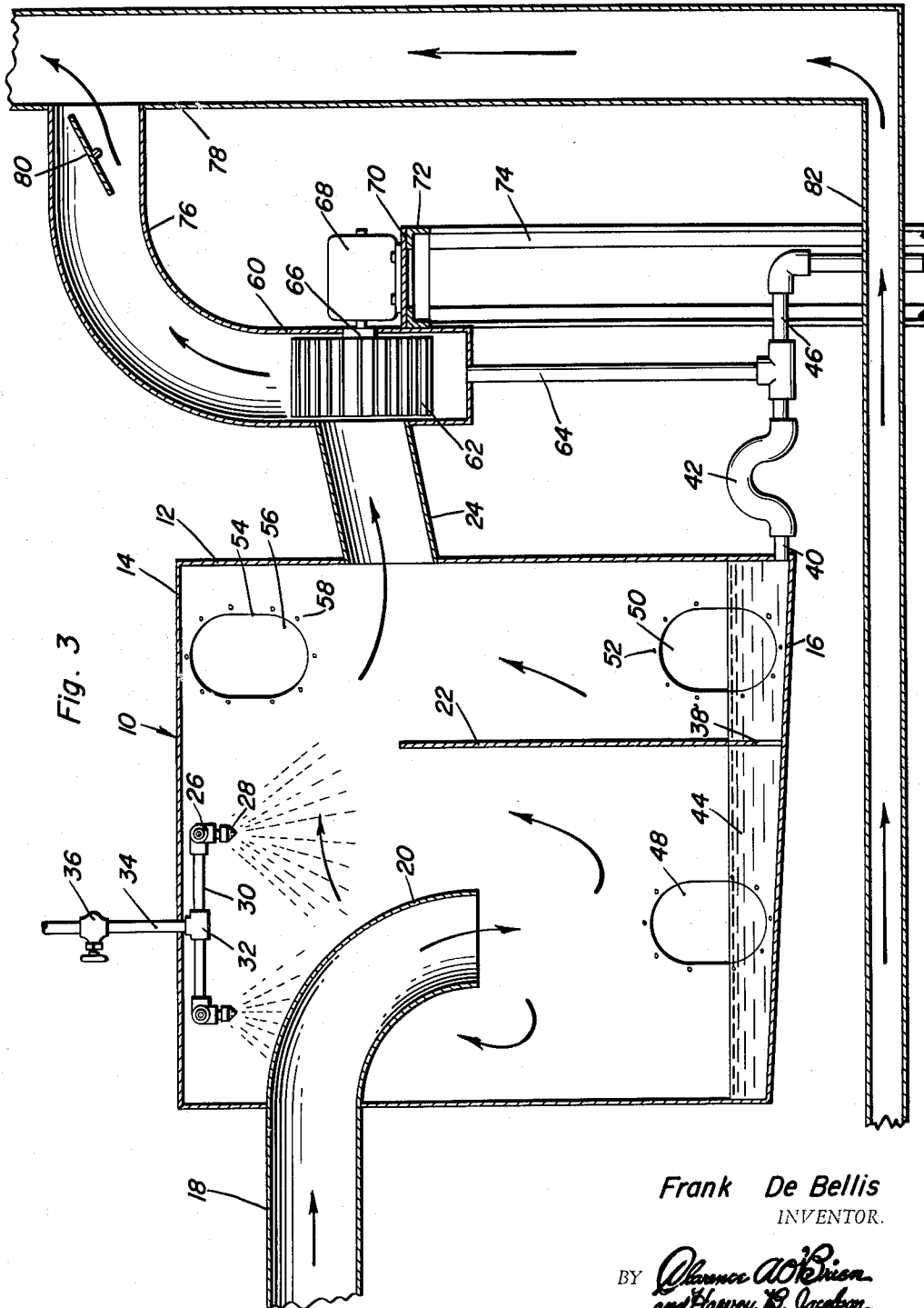
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Frank De Bellis
INVENTOR.

BY *Clarence A. O'Brien*
and *Harvey R. Jacobson*
Attorneys

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SMOKE WASHER

Frank De Bellis, 300 Harrison St., Gary, Ind.

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5 Claims. (Cl. 55-223)

The present invention generally relates to a device for cleaning or washing smoke and then discharging the cleaned smoke from a chimney or the like.

An object of the present invention is to provide a smoke washer adapted for use in conjunction with various industrial plants or wherever smoke is produced as a result of combustion. The smoke washer of the present invention incorporates a washing chamber through which the smoke initially passes and in which water passes through the smoke for entraining solid particles, fly ash, unburned particles and the like and the hot smoke will turn at least part of the water into steam thereby further serving to separate the dirt from the smoke so that it will be collected in the bottom of the washing chamber.

Another object of the present invention is to provide a smoke washer in which the smoke is conveyed through the washing apparatus by employing a fan device which has a discharge pipe communicating with a chimney or other discharge conduit.

Yet another object of the present invention is to provide a smoke washer incorporating two chambers therein with the first chamber having a water spray therein and a second chamber being in the form of a separation chamber communicated with a fan. The bottom of the chambers are slanted so that dripping water will drain from the bottom of the smoke washer.

Another object of the present invention is to provide a smoke washer having safety features therein to enable the device to be used when desired and taken out of service for repair or maintenance.

Another object of the present invention is to provide a smoke washer which is simple in construction, easy to install, well adapted for its particular purposes and relatively inexpensive to manufacture and operate.

These together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

FIGURE 1 is a perspective view of the smoke washer of the present invention;

FIGURE 2 is a plan view of the construction of FIGURE 1; and

FIGURE 3 is a vertical sectional view of the smoke washer illustrating the structural details of the components of the present invention.

Referring now specifically to the drawings, the smoke washer 10 of the present invention includes an enlarged housing or casing 12 of generally square or similar configuration and which includes a top wall 14 and an inclined bottom wall 16 which is inclined slightly and continuously throughout the length of the housing 12. One end of the housing 12 is provided with an inlet pipe, stack or conduit 18 by which waste gases, smoke and the like are discharged into the interior of the housing 12 by a downturned discharge end 20 on the inlet pipe 18 whereby the smoke will be discharged downwardly toward the inclined bottom 16.

Spaced between the end walls of the housing 12 is an upstanding partition wall 22 generally paralleling the end walls of the housing 12 and extending to a vertical height above the discharge end of the inlet pipe 18. The opposite end wall of the housing 12 is provided with an upwardly inclined outlet pipe 24 communicated there-

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with generally above the point of discharge of the inlet pipe 18 and generally in alignment with the top edge of the partition 22. As illustrated in FIGURE 3, the partition 22 is nearer the discharge pipe 24 than it is the end wall having the inlet pipe 18 therein and the upward inclination of the discharge pipe 24 will assure that any moisture deposited on the inner surface of the wall will drain back into the housing 12.

Disposed immediately below the top wall 14 is a pair of manifold pipes 26 each having a plurality of water discharge nozzles 28 attached thereto and extending downwardly therefrom. The manifold pipes 26 are interconnected by a connecting pipe 30 having a T-fitting 32 in the center thereof which is communicated with an upwardly extending supply pipe 34 extending up through the top 14 and provided with a manual control valve 36 therein for controlling discharge of water as a water spray into the smoke discharged from the discharge end 20 of the inlet pipe 18.

The water spray discharged from the nozzles 28 will pass through the smoke thus effectively washing the smoke and will then be deposited on the upper surface of the bottom 16. The lower edge of the partition 22 is provided with an aperture or apertures 38 for communicating the two chambers or compartments formed in the housing 12 so that the water collected in the bottom of the housing 12 may be discharged through a discharge pipe 40 at the lowermost corner thereof. The discharge pipe 40 is provided with an inverted U-shaped trap member 42 which serves only to retain the water 44 at a predetermined level in the housing 12. At least, the level will reach a predetermined position before it is discharged over the trap member 42 wherein the trap member 42 will then permit discharge of water thereover into a waste pipe 46 extending to a suitable collection tank, sewer or the like depending upon the nature of the discharged water since there is a possibility that the discharged water will be recirculated after cleaning.

Each of the compartments in the housing 12 is provided with an enlarged inspection or access opening 48 adjacent the bottom thereof which is closed by an inspection plate or cover 50 secured in place by a plurality of suitable fasteners 52 and a suitable seal ring or the like. There is also provided an inspection hole 54 adjacent the upper corner of the housing 12 with there also being a cover 56 thereon secured in place detachably by fastening bolts 58 or the like for enabling the interior of the housing 12 to be cleaned when deemed necessary.

Communicated with the discharge pipe 24 is a fan housing 60 having a fan 62 rotatably mounted therein. The bottom of the housing is provided with a drain pipe 64 communicated with the waste pipe 46 for draining any water that may be deposited in the housing 60. The fan 62 is provided with a drive shaft 66 drivingly connected to an electric motor 68 that is supported on a supporting plate 70 carried by a stand frame 72 having a plurality of depending angle iron legs 74 provided thereon for supporting the electric motor 68 in position for driving the fan 62. The fan 62 is preferably of the squirrel-cage type although the axial flow type may be employed. The squirrel-cage type provides a centrifugal action to the air for serving as a further separation of any moisture entrained in the air so that it can be drained through the discharge pipe 64. The cleaned smoke moved by the fan is discharged through an outlet pipe 76 communicated with a smoke stack or chimney 78 with the discharge pipe 76 being tangential to housing 60 and curved in any suitable manner to connect with the chimney or exhaust stack 78.

In the discharge pipe or conduit 76, there is provided a manual damper or butterfly valve 80 which closes off

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the smoke washer from the stack or chimney 78. As illustrated in FIGURE 3, the stack or chimney 78 is also in communication with a pipe or conductor 82 which may be of equal size to the stack or chimney or may be smaller or larger and this conduit 82 communicates with the source of smoke so that the smoke may either pass through the smoke washer or pass directly into the chimney by passing through the conduit 82 in which event the damper 80 would be closed.

The water nozzles may be of any suitable type but it is desirable that the pattern of water discharged therefrom cover substantially the entire cross-sectional area of the washing compartment of the housing 12. Suitable valving may be provided wherever desired such as in the water supply pipe and also in the water drain pipes 40 or 46 and also the water drain pipe 64 if desired. The electric motor 68 may be of variable speed so that the speed of the fan can be adjusted as desired. The closure plates or doors 50 and 56 may be provided with handles to facilitate handling thereof and fireproof gaskets may be employed. When the smoke is discharged into the spray of water, the temperature of the smoke will be materially decreased thus serving to precipitate unburned gases and also remove carbon particles, fly ash and the like from the smoke. Also, the moisture or water is at least partially converted to steam which, when cooled with further contact with water spray or due to passage around the partition will serve to further precipitate dirt out of the smoke thus enabling cleaner smoke to be discharged. The device may be constructed of any suitable material and may be of any suitable size depending upon the volume of smoke passing therethrough.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modification and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly all suitable modifications and equivalents may be resorted to, falling within the scope of the invention as claimed.

What is claimed as new is as follows:

1. A smoke washing apparatus comprising a hollow housing defined by a peripheral wall, a top and a bottom, said bottom being inclined to form a low point therein, drain means communicated with the low point of the bottom for drainage of water therefrom, a smoke inlet conduit communicating with one side of said housing, a cleaned smoke outlet conduit communicated with said housing at an opposite side thereof in relation to the inlet conduit, an upwardly extending partition disposed within said housing between the inlet and outlet conduit with the partition being connected to the bottom and spaced below the top of the housing, a plurality of water spray nozzles disposed above the smoke inlet conduit whereby incoming smoke will be intermingled with water discharged from the spray nozzles, fan means communicated with the outlet conduit for discharging the clean smoke into a discharge stack, said partition having opening means in the lower edge thereof for enabling passage of water along the inclined bottom, said fan means including a centrifugal type of fan including a fan housing communicated with the outlet conduit and a discharge pipe communicating with the discharge stack, drain means in the lower portion of the fan housing, said fan housing including a tangential discharge pipe communicated therewith and also communicating with a discharge stack, a damper mounted in the discharge pipe, and a by-pass pipe from the source of smoke communicated with the discharge stack and by-passing the smoke washer when the smoke washer is not in service.

2. A smoke washing apparatus comprising an enlarged hollow housing defined by a peripheral wall, a top and a bottom, a smoke inlet conduit communicated with said housing, a smoke outlet conduit communicated with said housing in opposite relation to the smoke inlet conduit,

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an upright partition disposed in said housing between the smoke inlet conduit and outlet conduit with the partition being connected to the bottom and spaced from the top of the housing for dividing the housing into two chambers, a plurality of spray nozzles disposed adjacent the top of the housing in overlying relation to the chamber of the housing with which the smoke inlet conduit is communicated whereby incoming smoke will be intermingled with water discharged from the spray nozzles, fan means communicated with the outlet conduit and discharging into a discharge stack, and drain means communicated with the bottom of the housing for discharging dirty water after it has washed the smoke, the bottom of said housing being inclined from the inlet portion thereof to the outlet portion with the drain means being communicated with the lowermost point on the housing for drainage of water from the bottom, said partition having opening means where it joins with the bottom so that water from both chambers may be discharged from the drain means, said drain means including an inverted U-shaped pipe member installed in a drain pipe for assuring a predetermined level of water in the bottom of the housing, said inlet conduit including a downturned discharge end orientated within the chamber having the water nozzles located therein whereby the smoke will be discharged toward the bottom of the housing, said outlet conduit being inclined upwardly and outwardly whereby any condensate on the walls of the outlet conduit will drain back into the housing, said housing being provided with a plurality of inspection openings, covers mounted on said openings for enabling access therethrough thereby enabling the housing to be cleaned out when desired.

3. The structure as defined in claim 2 wherein said partition extends above the discharge end of the smoke inlet conduit for providing a tortuous path for the smoke passing through the smoke washer.

4. The structure as defined in claim 3 wherein said fan means includes a centrifugal type fan for further extracting water from the cleaned smoke, a fan housing communicated with the outlet conduit, a drain pipe extending from the bottom of the fan housing to the drain means for the housing, and a variable speed electric motor for driving the fan at a speed to induce flow through the housing at a volume capable of being thoroughly cleaned by the smoke washer.

5. A smoke washing apparatus comprising an enlarged hollow housing defined by a peripheral wall, a top and a bottom, a smoke inlet conduit communicated with said housing, a smoke outlet conduit communicated with said housing in opposite relation to the smoke inlet conduit, an upright partition disposed in said housing between the smoke inlet conduit and outlet conduit with the partition being connected to the bottom and spaced from the top of the housing for dividing the housing into two chambers, a plurality of spray nozzles disposed adjacent the top of the housing in overlying relation to the chamber of the housing with which the smoke inlet conduit is communicated whereby incoming smoke will be intermingled with water discharged from the spray nozzles, fan means communicated with the outlet conduit and discharging into a discharge stack, and drain means communicated with the bottom of the housing for discharging dirty water after it has washed the smoke, the bottom of said housing being inclined from the inlet portion thereof to the outlet portion with the drain means being communicated with the lowermost point on the housing for drainage of water from the bottom, said partition having opening means where it joins with the bottom so that water from both chambers may be discharged from the drain means, said drain means including an inverted U-shaped pipe member installed in a drain pipe for assuring a predetermined level of water in the bottom of the housing, said inlet conduit including a downturned discharge end orientated within the

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chamber having the water nozzles located therein whereby the smoke will be discharged toward the bottom of the housing, said outlet conduit being inclined upwardly and outwardly whereby any condensate on the walls of the outlet conduit will drain back into the housing, said housing being provided with a plurality of inspection openings, covers mounted on said openings for enabling access therethrough thereby enabling the housing to be cleaned out when desired, said partition extending above the discharge end of the smoke inlet conduit for providing a tortuous path for the smoke passing through the smoke washer, said fan means including a centrifugal type fan for further extracting water from the cleaned smoke, a fan housing communicated with the outlet conduit, a drain pipe extending from the bottom of the fan housing to the drain means for the housing, and a variable speed electric motor for driving the fan at a speed to induce flow through the housing at a volume capable of being thoroughly cleaned by the smoke washer, said fan housing including a tangential discharge pipe communicated therewith, the other end of the discharge pipe communicating with the discharge stack, and a butterfly type of

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damper mounted in the discharge pipe for enabling the smoke washing apparatus to be cut off from the stack, said stack having a by-pass pipe from the source of smoke communicated therewith below the discharge pipe for carrying waste smoke products past the smoke washer when the smoke washer is not in service.

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20 HARRY B. THORNTON, *Primary Examiner*.
D. K. DENENBERG, *Assistant Examiner*.