

April 30, 1963

E. T. ATTANASIO ETAL

3,087,443

SMOKE ERADICATOR FOR TRASH BURNING BUILDING

Filed Jan. 9, 1959

4 Sheets-Sheet 1

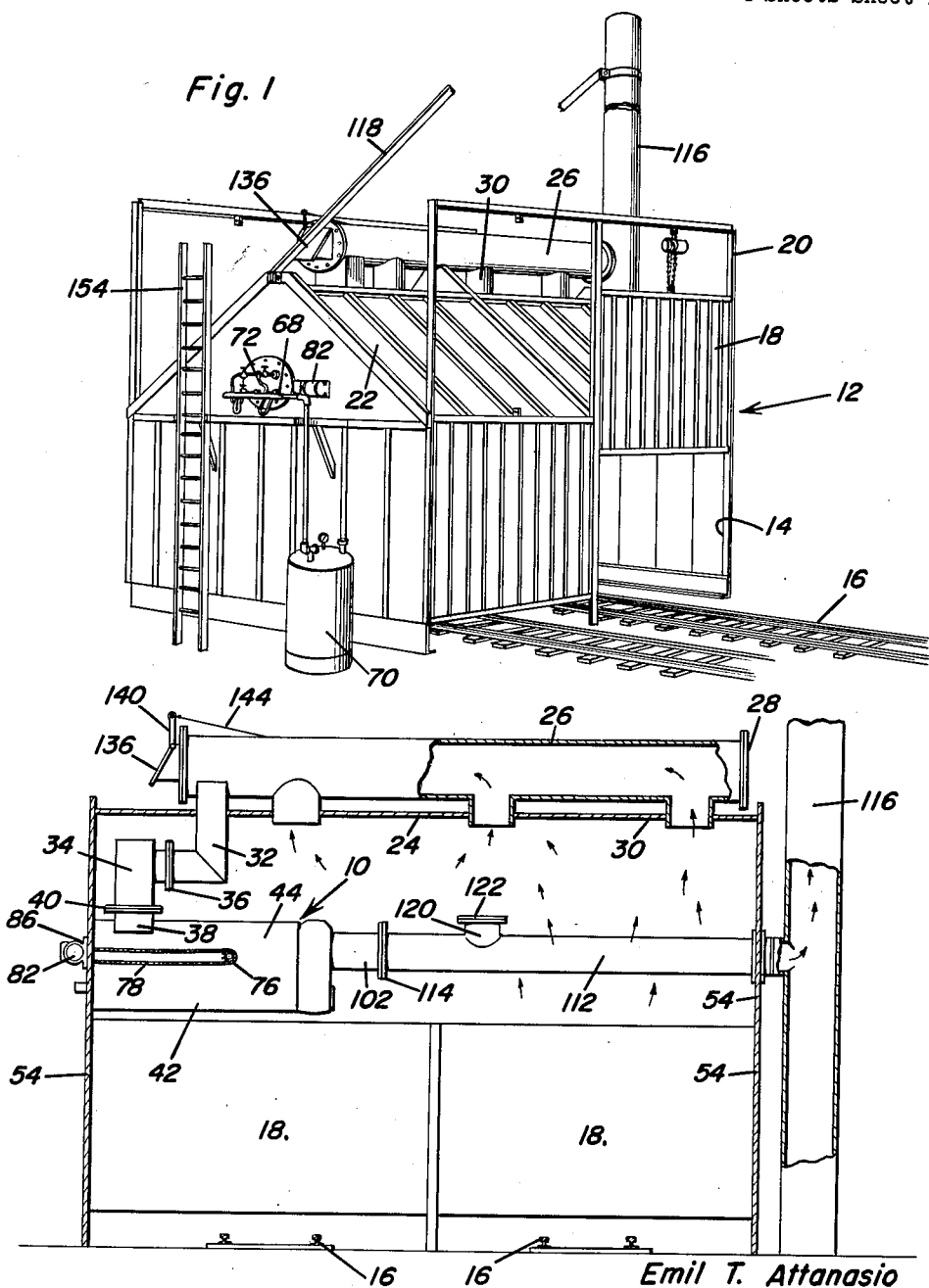


Fig. 2

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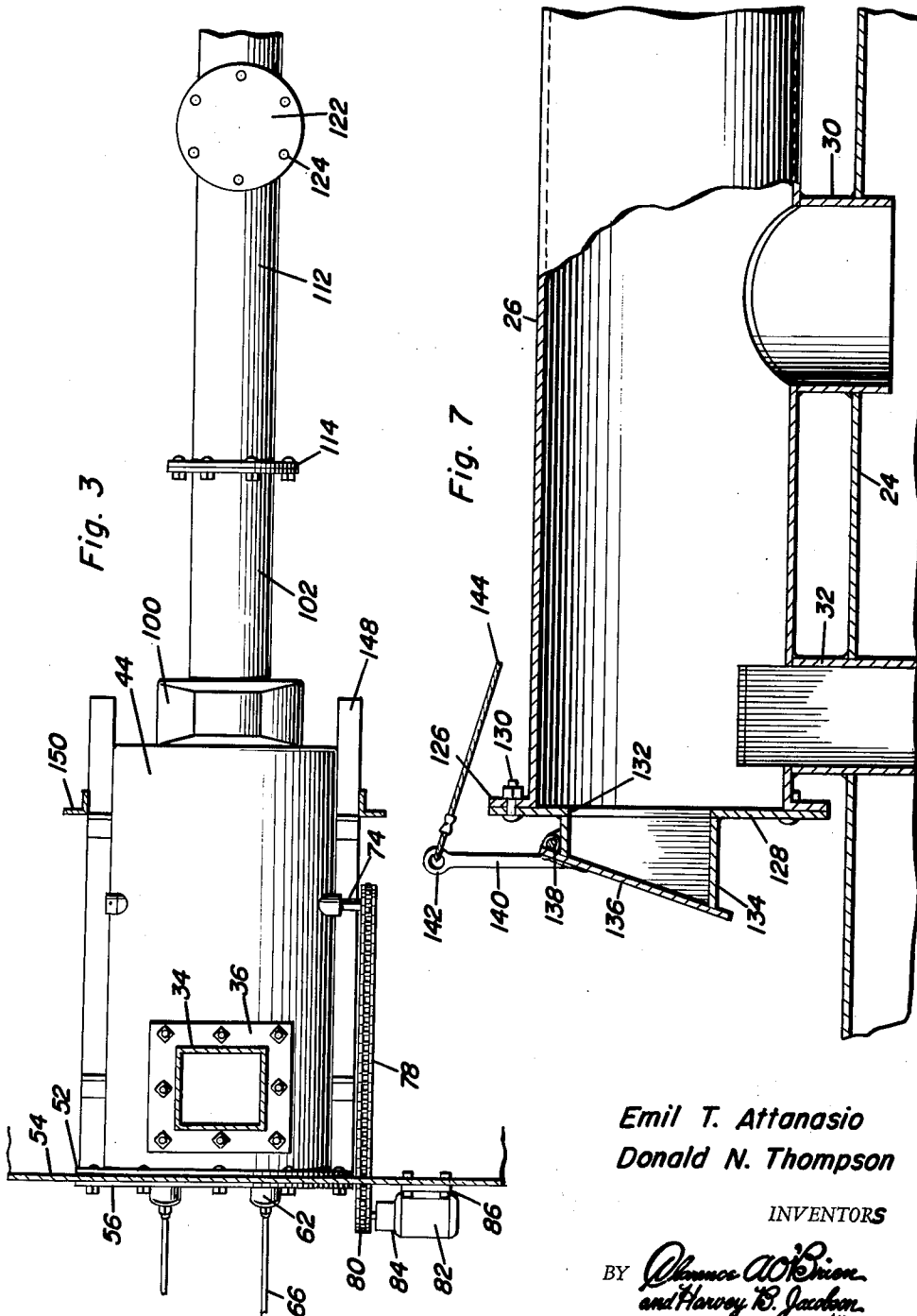
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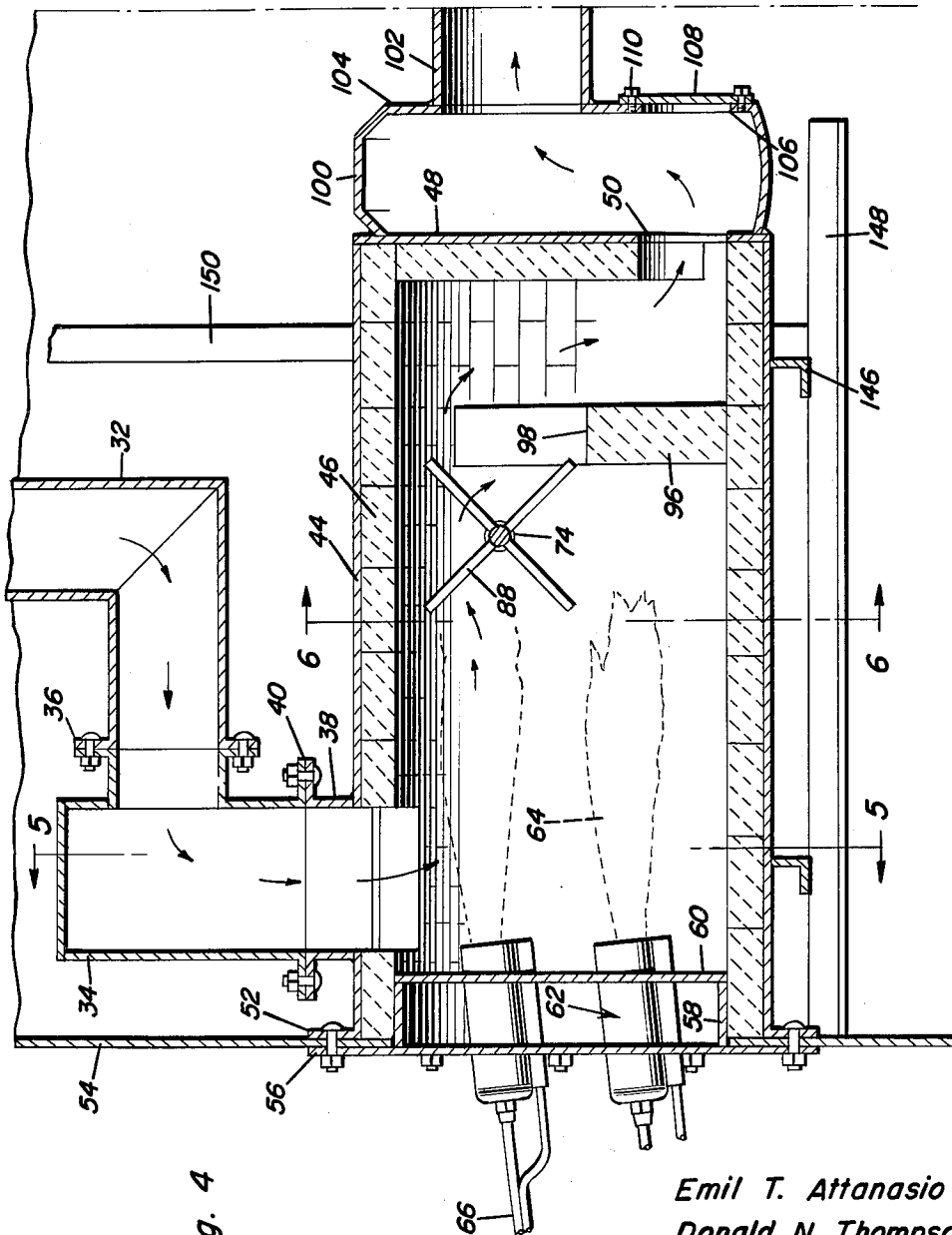


Fig. 4

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Fig. 6

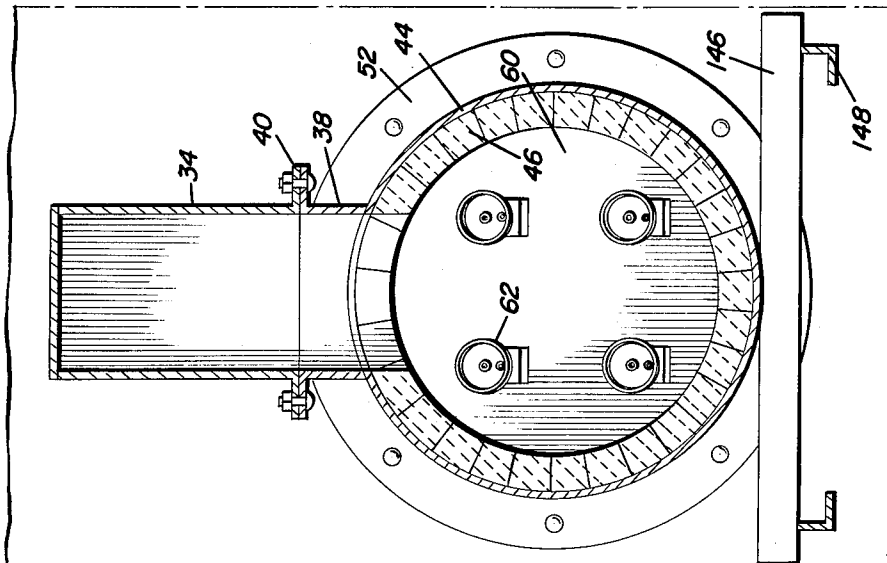
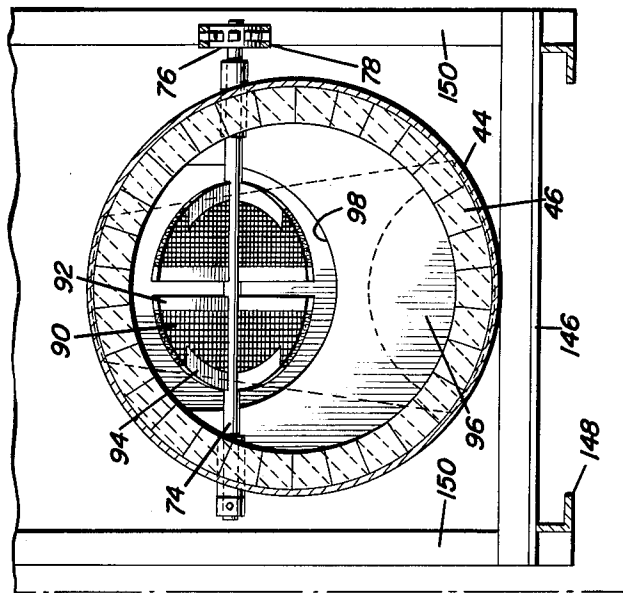


Fig. 5

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SMOKE ERADICATOR FOR TRASH BURNING BUILDING

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4 Claims. (Cl. 110-18)

The present invention generally relates to a smoke eradicating device and more particularly to such a device for use in combination with buildings in which trash is burned and especially buildings in which burnable material is burned from automobiles prior to their use as scrap metal.

Smoke abatement and elimination is a considerable problem in urban areas and various localities have various regulations for preventing the excessive accumulation of smoke. In fact, it has been found that excessive smoke and similar impurities in the air causes certain respiratory ailments and generally provides an undesirable atmospheric condition. While there have been many devices provided for smoke elimination or eradication, the primary object of the present invention is to provide a device which will eradicate smoke and fly ash with the eradicator being particularly constructed for use on a building in which trash such as automobiles are burned at which time the automobile tires, cushions and the like all are burned which notoriously produce a large volume of smoke but the smoke produced thereby is eradicated by the device of the present invention.

Another object of the present invention is to provide a smoke eradicator which discharges no smoke from the smoke stack but yet which permits the burning in an enclosure of products notoriously providing a dense smoke discharge.

Another object of the present invention is to provide a smoke eradicator employing components associated in a novel manner and forming a new process for eliminating smoke emanating from the burning material. This structure and process eliminates 65% of the flyash when it comes into contact with a flyash disintegrator and the combination flue and velocity restrictor before it reaches the thermal reductor. The remainder of the smoke then rises to the top of the building and is drawn into the reductor by conduction and in turn is drawn into a combustion chamber by the same method.

Another important object of the present invention is to provide a smoke eradicator particularly constructed for use with buildings in which old automobiles may be burned but which may be adapted for use with various types of buildings and other trash burning facilities and which incorporates novel structural features which renders the device efficient in operation, dependable, easy to operate, easy to install, efficient and generally inexpensive to manufacture and maintain.

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 a building with the smoke eradicator of the present invention installed thereon;

FIGURE 2 is a schematic elevational view of the smoke eradicator with portions thereof in section illustrating the general layout of the device;

FIGURE 3 is a plan sectional view of the smoke eliminator taken generally below the roof line of the building;

FIGURE 4 is a detailed longitudinal sectional view of the combustion chamber and associated structure;

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FIGURE 5 is a vertical sectional view taken substantially upon a plane passing along section line 5-5 of FIGURE 4 illustrating the structural details of the closure member and orientation of the burner units;

FIGURE 6 is a transverse sectional view taken substantially upon a plane passing along section line 6-6 of FIGURE 4 illustrating further structural details of the combustion chamber and particularly the screen panel mounted therein; and

FIGURE 7 is a partial sectional view of the smoke collector and header disposed at the peak of the roof of the building.

Referring now particularly to the drawings, the numeral 10 generally designates the smoke eradicator of the present invention which is adapted to be installed on a building 12 of the type used for burning trash such as old automobiles for the purposes of eliminating all burnable material from the automobiles prior to their use as scrap metal. Such burnables normally include upholstery, tires, cushions, various rubber installations, grease and the like all of which produce heavy smoke. The building 12 generally includes a pair of passageways 14 each having a trackway 16 extending therethrough together with a movable closure 18 which is supported in a framework 20 for raising and lowering of the same so that a carrier mounted on the trackway 16 having trash such as a used and old automobile may be run into the building and may be moved out of the building on the same trackway which extends through the other side after the same has been burned. The building is of the portable type and is constructed in a buckle proof manner with the roof being described only to illustrate one installation which has been successfully employed. The building 12 also includes roof panels 22 which converge to form an apex or peak 24 all of which are closed to form an enlarged smoke chamber for receiving the hot smoke from the burning automobiles or cars.

The smoke eradicator includes an elongated hollow and cylindrical thermal manifold or tubular member 26 disposed longitudinally of the building and above the roof peak 24 in the atmospheric air. One end of the manifold 26 is closed by a closure plate 28 rigidly connected thereto. Also, the manifold 26 is provided with a plurality of short intakes 30 which extend downwardly through the peak 24 of the roof and terminate in open ends in the apex area of the roof. The manifold 26 has been especially designed as to size and area and capacity to draw off by conduction the unburnt hydrocarbon material that escaped the disintegrator and the flue in the burning area. Its function is to collect the hydro-carbon from within the burning chambers and to cool it by atmospheric ambient air wherein by conduction it passes the smoke along to the firebox. Its position may be atop the roof, in a horizontal position, mounted vertically on the side of the building horizontally or in any desired position. It also may contain screen filters and an exhaust fan. The outside location is expressly for the purpose of acting as a cooling chamber wherein hot flyash coming into it is immediately knocked back (unburnt) into the burning areas below. This is done by convection (the gravity force). The smoke intake pipes are designed in such a manner and located in accordance with the cubic density and volume of smoke created in the burning areas and must be in proportion also with the cubic capacity of the firebox. It can be any shape but square or oblong.

The end of the manifold 26 remote from the closed end plate 28 is provided with a depending L-shaped pipe which goes into an enlarged inlet chamber 34 that is connected with the pipe 32 by a flanged connection 36 and is connected to an inlet adapter 38 by a flange connector 40. The inlet adapter 38 forms an inlet for a combustion chamber generally designated by the numeral 42.

The combustion chamber 42 includes a generally enlarged cylindrical shell 44 which is lined throughout the periphery and one end wall thereof with fire brick 46. The lined end of the combustion chamber is also provided with a metal end wall 48 having a discharge opening 50 adjacent the bottom thereof with the fire brick lining 46 also being omitted for the area of the opening 50.

The front end of the cylindrical shell 44 is provided with a peripheral flange 52 which is bolted to the end wall 54 of the building and which also secures a closure plate 56 to the open end of the combustion chamber. The closure plate 56 is provided with an inwardly extending flange 58 having an inner end wall member 60 rigid therewith. The inner wall member 60 and the peripheral wall 58 and the end plate 56 form a closure for the combustion chamber and telescope within the open end of the same with the flange 58 engaging the interior surface of the fire brick insulation.

A plurality of burner assemblies 62 extend through the end plate 56 and the inner plate 60 and are disposed in inclined relation so that the flame 64 propagated thereby will extend substantially throughout the area and length of the combustion chamber. There are four burner assemblies or torches arranged in a pattern as illustrated in FIGURE 5 and in an orientation as illustrated in FIGURE 4. Each of the burner assemblies 62 is connected with a fuel supply hose line 66 which in turn is connected with a supply manifold 68 connected to a source of fuel supply such as a tank 70. Control valves 72 may be provided for controlling the burners and a suitable pressure pump may be provided for pressurizing the fuel as necessary. The torches may burn kerosene, fuel oil, L.P. gas, natural or artificial gas.

Extending transversely of the combustion chamber adjacent the center but near the closed end 48 is a transverse rotatable shaft 74. The shaft 74 is provided with a sprocket wheel 76 on the outer end thereof which is driven by a sprocket chain 78 which also encircles a sprocket gear 80 disposed exteriorly of the building end wall. The gear 80 is powered by an electric motor 82 through a reduction gear system 84 wherein the shaft 74 will be driven at a very low rate of speed such as 47 to 50 r.p.m. The motor 82 may be supported on the end wall by a bracket 86.

Mounted on the shaft 74 is a plurality of radially extending paddles 88 each of which are constructed of a segment of screen mesh 90 having one radial edge provided with a reinforcing metal strip 92 and a portion of the arcuate edge also provided with an arcuate strip 94 for engagement with the shaft 74 thus mounting the screen mesh segments 90 in place. The radial strips 92 are spaced from each other and the mesh screen 90 will receive and retard fly ash so that the same will be completely consumed. It is noted that the peripheral edges of the radial baffles 88 are smooth in relation to the surface of the baffles thereby permitting the fly ash to drop off of the edges of the baffles.

The rotatable paddle wheel formed by the baffles 88 is located immediately forwardly of a partition wall 96 having a recessed upper end 98 conforming somewhat to the contour of that portion of the paddle wheel located adjacent thereto thereby assuring that substantially all of the products passing through the combustion chamber will pass over and through the baffle plates. As the products pass through the combustion chamber, they will proceed downwardly behind the baffle wall 96 and thence out through the opening 50.

Located on the rear wall 48 is a fly ash chamber 100 receiving the material from the opening 50 and having a discharge conduit 102 connected thereto adjacent the upper end thereof. The fly ash chamber 100 is generally trapezoidal in shape and provided somewhat with a dome shaped upper end. Also, the rear wall 104 of the fly ash chamber 100 is provided with an inspection and clean out

opening 106 that is provided with a closure plate 108 retained in position by fastening bolts 110.

The conduit 102 is connected with an enlarged conduit 112 by a flanged coupling 114. The conduits 102 and 112 are of the same diameter and extend generally parallel to the manifold 26 but are disposed below the apex or ridge 24 of the roof of the building. The conduit 112 extends through the other end wall 54 of the building and communicates with a vertically elongated stack 116 which is supported from a supporting surface and, of course, exhausts to the atmosphere at a relatively high elevation. The upper end of the stack 116 may be braced by a suitable bracing member 118 connected with the apex of the building roof.

Intermediate the flange coupling 114 and the end wall 54 through which the conduit 112 passes, the conduit 112 is provided with an upstanding tubular conduit portion 120 which is closed by a closure plate 122 secured thereon by fastening bolts 124 or the like. The tubular portion 120 extends vertically and will receive a column of gases which will be cooled somewhat due to the temperature differential between the interior of the conduit 112 and the surrounding ambient gases thus providing a cooled column of gases in intersecting relation to the gases passing along the conduit 112 thus tending to restrict the flow of gases along the conduit 112 thus controlling the rate of discharge of the gases from the stack 116 for assuring optimum operating conditions within the smoke eradiator and preventing an excessive rate of discharge of gases from the stack 116.

For preventing any possible explosion when the trash within the building is initially igniting by a person entering the building, the manifold 26 is provided with a peripheral flange 126 receiving an end plate 128 held in position by fastening bolts 130. The end plate 128 is provided with an opening 132 with a peripheral flange 134 projecting longitudinally outwardly thereof and terminating in an inclined edge having a closure plate 136 resting thereagainst and pivotally supported from the flange 134 by a pivot pin 138. An opening arm 140 is rigid with the closure plate 136 and extends beyond the hinge pin 138 with the outer end of the arm 140 having an eye 142 connected with an operating line 144 whereby the closure door 136 may be raised to an open position for permitting venting of the manifold and the entire building prior to ignition of the trash within the building thereby preventing any possible explosion of any accumulated combustible gases within the building.

The combustion chamber is supported by a plurality of transverse frame members 146 and longitudinal frame members 148 and also vertical frame members 150 which is in addition to the connection to the end wall 54. Also, an access ladder 154 is provided for access to the combustion chamber for controlling the valves and otherwise adjusting and cleaning the device.

In use, the smoke eliminator will eliminate even the heaviest smoke and discharge from the chimney or stack no noticeable smoke and will discharge the material substantially free of fly ash or the like.

In appearance the combustion chamber unit resembles a conventional after-burner, however, its function is entirely different and the design adaptations installed within its interior and others on its exterior place it in an entirely new category.

Its functions is not to radiate heat as conventional after-burners do; it has been designed for the express purpose of burning up and consuming hydro-carbon smoke produced by improper combustion of materials being burned in an adjacent area. Its style can be any shape other than square or oblong. Cylindrical is preferred. Its cubage must be in exact proportion to the cubage, volume and density of smoke being emitted from the burning chambers adjacent. It also must be in cubic proportion to the thermal heat manifold described later. Its position can be horizontal, vertical or at an angle.

It can be placed directly within the material burning area or placed outside and adjacent to the burning areas. It must not radiate heat regardless of the B.t.u.'s developed. Its heat must not be below 1400° F. and is desirable at 2000° F. with a forced flare type flame emitted from a multiple of oil, L.P.G., natural or artificial gas burners combined with additional oxygen to produce a constant B.t.u. heat of a minimum of 1,500,000 per hour. Installed in its interior are fire brick which line its shell. Also in its interior to the rear is an opening for the exhaust of heat and CH₄. A brick baffle running half way up the fire box tends to restrict velocity and prevent the escape of hydro-carbon gas. It is located in the rear in front of the exhaust hole. An entirely new component has been added to the interior of the chamber, the B.t.u. Impeller. This functions to pull the smoke current from the thermal manifold into the fire chamber. Its fine mesh screen spreads a flame over itself giving a ball of flame in rotation towards the incoming smoke and meeting the smoke with an intense flame increased by fuel provided by the smoke in addition to that produced by the burners and completes proper combustion of all hydro-carbon. This unit is chain driven by an electric motor mounted outside the burning chambers. Its speed must be adjusted to the smoke current coming from the manifold which is approximately 50 r.p.m. This is done with a reducing gear attached to the motor.

While the temperatures in the building or burning area may vary depending on the material being burned, it has been found that the following temperatures are typical. In the thermal manifold 800-900° F.; in the combustion chamber 2,000° F. and 1,632,000 B.t.u. input; in the fly ash disintegrator 1650-1725° F.; in the horizontal flue 1325° F.; in the stack 900-1100° F.; and the restrictor will form a column of air approximately 250° F. cooler than the air in the flue thus forming a slow down or restrictor for the products flowing through the flue. A plurality of restrictors may be employed in the flue and the stack may terminate at almost any height since the rotating paddle wheel is used to force flow through the steps of the process.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications 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. In combination with a trash burning building having closure doors forming an entrance way for positioning trash within the building, said building having an inclined roof structure with an apex, a horizontally disposed tubular member overlying the apex of the roof of the building and communicated with the interior of the building structure for receiving all of the products of combustion within the building, said tubular member having direct vertical communication with the apex of the roof whereby ambient air surrounding the tubular member will cool the products of combustion thereby precipitating heavy fly ash particles back into the building, an enlarged combustion chamber disposed within the building and communicated with one end of said horizontally disposed tubular member for receiving combustion products therefrom, said combustion chamber including a plurality of burner assemblies in one end thereof which propagate flame longitudinally in the combustion chamber, a horizontally disposed flue communicated with one end of the combustion chamber and extending longitudinally in the building structure below the apex of the roof, and an exhaust stack communicated with the end of the flue remote from the combustion chamber with the exhaust stack extending above the roof of the building for forming a discharge from the com-

bustion chamber and providing a draft for the building, said burner assemblies completely consuming any burnable material within the combustion products, and baffle means disposed in the combustion chamber at a point remote from the burner assemblies for removing fly ash thereby discharging smokeless heated gases free of burnable hydrocarbons or other material, said baffle means including an upstanding partition wall connected with the bottom of the combustion chamber and providing a space between the upper edge of the partition wall and the upper portion of the combustion chamber for passage of gases thereover, the end wall of the combustion chamber remote from the burner assemblies having an opening adjacent the bottom thereof, and a fly ash eliminating chamber connected with the discharge opening in the bottom of the end wall of the combustion chamber with the flue communicated with the fly ash eliminating chamber adjacent the upper end thereof thereby providing a tortuous path for the heated gases for eliminating fly ash therefrom, the combustion chamber further being provided with a rotatable paddle wheel disposed therein intermediate the burner assemblies and the partition wall, said paddle wheel including a plurality of screen mesh blades, a shaft journaling the paddle wheel for rotation about a transverse axle, means connected with the paddle wheel for rotatably driving the paddle wheel, said paddle wheel being disposed in the path of flame propagation of one of the burner assemblies whereby the flame will impinge upon the paddles of the paddle wheel and spread over the surface thereof for more effectively consuming the fly ash and other burnable products.

2. The combination as defined in claim 1 wherein said flue is provided with a vertically disposed tubular riser thereon intermediate the ends thereof which will receive a column of heated gases for cooling wherein the cooled column of gases will act as a flow restrictor in the flue thereby limiting the velocity of flow of heated gases through the combustion chamber.

3. The combination of claim 2 wherein said horizontally disposed tubular member above the apex of the roof of the building is provided with a vent in one end thereof, a closure plate for said vent, manual means connected with the closure plate for opening and closing the plate whereby the interior of the building, roof structure and tubular member may be vented of burnable hydrocarbons and the like when the material within the building structure is ignited thereby preventing any possibility of explosion of burnable gases accumulated in the apex of the roof or in the tubular member.

4. The combination of claim 3 wherein said closure doors for the building structure are vertically slidable, a track extending through the building whereby a carriage having a wrecked automobile or the like thereon may be pushed into the building for consumption of all burnable material on the wrecked automobile thereby enabling the metal of the wrecked automobile to be reclaimed.

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