United States Patent [19]

Shinpoch

[11] **3,742,873**

[45] **July 3, 1973**

[54] **SMOKELESS INCINERATOR**

[76] Inventor: **Jack E. Shinpoch,** P.O. Box 51, Mojave, Calif. 93501

[22] Filed: **July 28, 1971**

[21] Appl. No.: **166,916**

[52] **U.S. Cl.** ..... **110/8 R,** 110/49 R

[51] **Int. Cl.** **F23g 5/00**

[58] **Field of Search** ..... 110/49, 8 R, 8 A, 110/18 R, 15

[56] **References Cited**

UNITED STATES PATENTS

2,811,937	11/1957	Bauchard	110/49 X
2,259,967	10/1941	Vogel-Jorgensen	110/15
2,754,779	7/1956	Toepel	110/8
3,538,865	11/1970	Lausmann	110/18

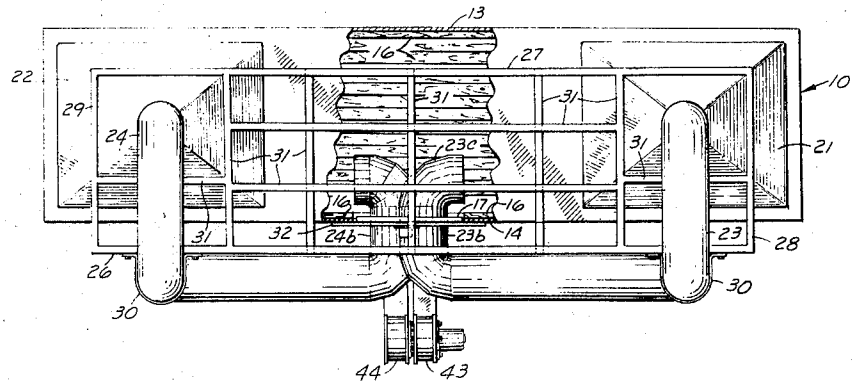
Primary Examiner—Kenneth W. Sprague

Attorney—Dominick Nardelli

[57] **ABSTRACT**

An incinerator is disclosed wherein the firebox has three openings, one being located higher than the other two, and wherein a conduit is provided to conduct gases exhausted therefrom to preferably the lowest one of the openings. Within the conduit is provided a venturi pump through whose throat is pumped air so that the venturi may draw the exhaust gases through the conduit, mixing the gases with the air and discharging the mixture into the firebox. Finally, the gases are exhausted from the remaining opening, relatively free of smoke or hydrocarbons. Preferably, the recirculation unit that includes the conduit and venturi pump is removeable so that any steel container may be used as a firebox.

3 Claims, 4 Drawing Figures



PATENTED JUL 3 1973

3,742,873

SHEET 1 OF 2

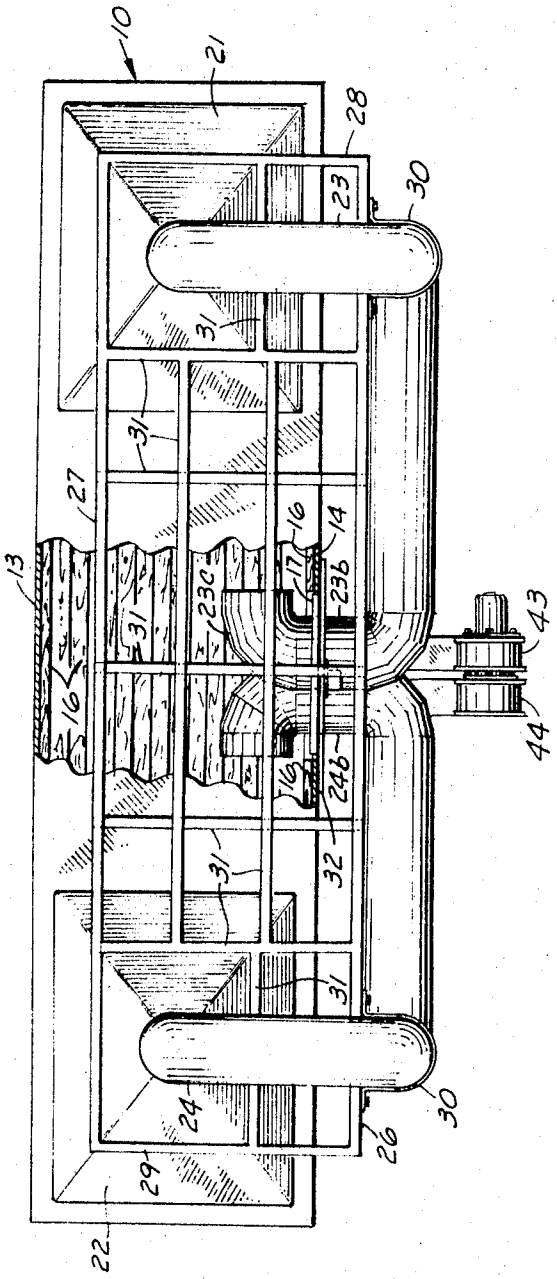


Fig. 1

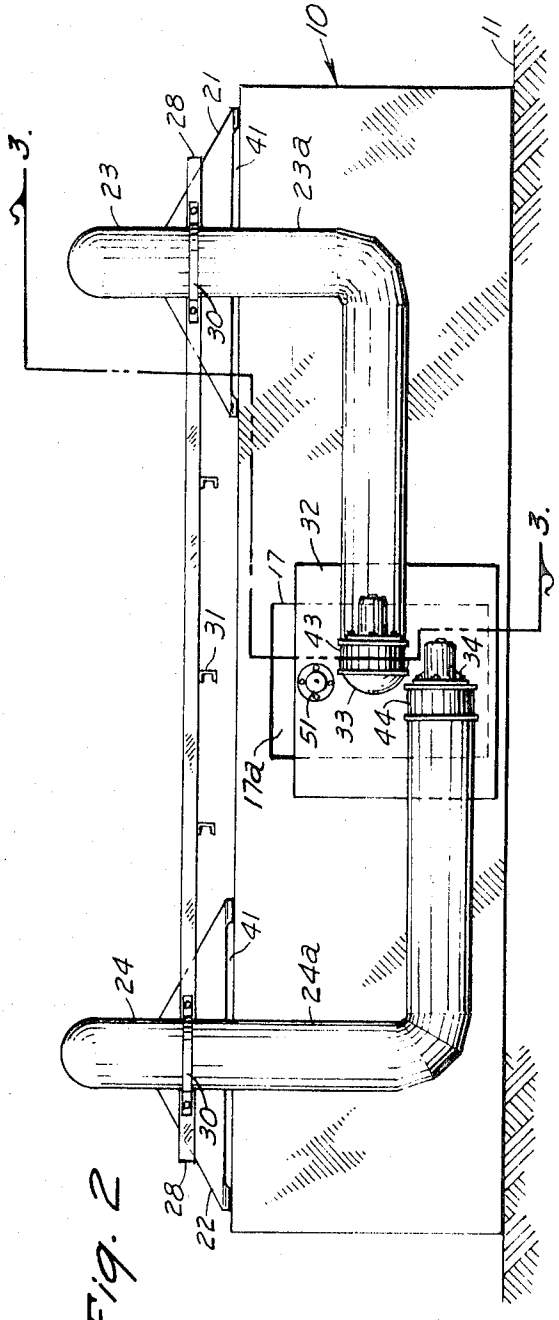


Fig. 2

INVENTOR.
JACK E. SHINPOCH
BY
Dominick Randall

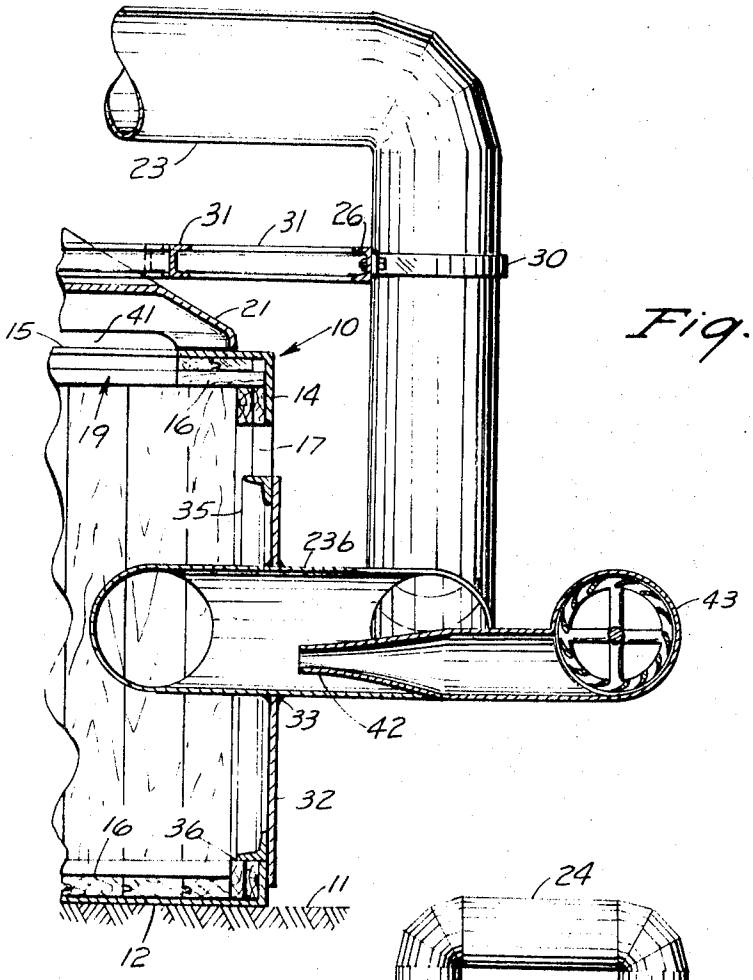


Fig. 3

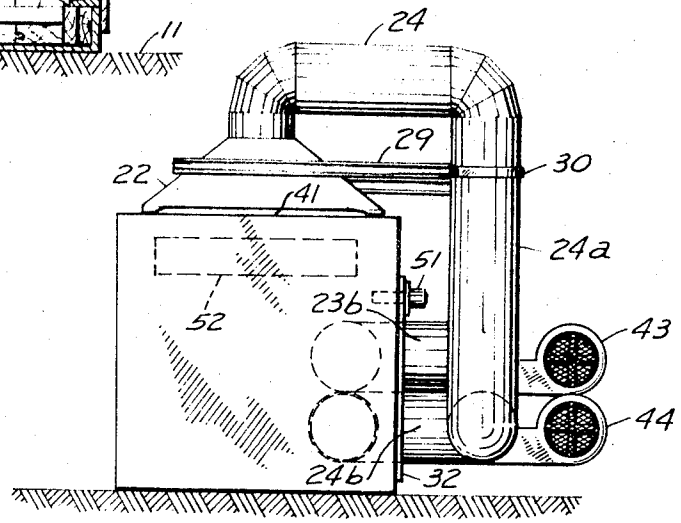


Fig. 4

INVENTOR.
JACK E. SHINPOCH
BY
Dominick Nadelli

SMOKELESS INCINERATOR

FIELD OF INVENTION

This invention relates to an incinerator and, more particularly, to a means incorporated therewith for substantially reducing the amount of smoke exhausted into the atmosphere.

BACKGROUND OF THE INVENTION

The discharge of smoke and soot from furnaces, stoves, fireplaces, etc., which herein I generically named incinerators, is a public nuisance which, for a long time, localities have been trying to abate. In recent years, with the noticeable increase of dirty air even in the desert regions of our country, many communities have banned open burning. Although this may help to clean the air, dumps for waste materials, especially items too large to be burned in acceptable incinerators, are becoming larger and uglier. For example, before open burning was banned, old freight cars, box and refrigerator, were taken to the Mojave Desert and sold for salvage because the steel could be stripped by burning. Now, with a ban on burning, the freight cars are dumped on the side of the track and the railroad companies pay to have them hauled to a dump site. There the cars remain because the labor cost for removing the steel is too much to make the operation profitable. Therefore, besides having the landscape littered and degraded, we are depleting our natural resources since every ton of unused scrap iron means several tons of ore need to be mined.

The prior art suggests various methods of reducing the smoke emission from incinerators. For example, back in 1926, U.S. Pat. No. 1,584,947 suggests that smoke emission can be reduced by drawing off some of the exhaust gases from the smokestack, adding air and passing the gas mixture through a centrifugal blower back into the furnace to burn. Obviously, if there is smoke in the exhaust gases being drawn from the stack, there is smoke in the gases going up the stack. U.S. Pat. No. 1,593,102 teaches that the exhaust gases may be washed to remove the smoke. Obviously, this is an uneconomical method. Other U.S. Pat. Nos. such as 1,639,726; 2,013,921, and 2,302,628 teach various methods of drawing off some of the exhaust gases from the stack and recirculating them back into the firebox which methods they each believed to be better than the previous. In U.S. Pat. No. 2,811,937 there is a suggestion that the smoke containing gases can be drawn off from the top of the firebox, mixed with air to lower the temperature so that the gases may be forced by a centrifugal fan into the firebox, while the gases to be exhausted into the atmosphere are drawn from a point lower down in the firebox. Although this method consumes smoke, the degree of reduction is not acceptable for present day demands because to have complete combustion, burning should take place at relatively high temperatures. The incinerator arrangement, as taught by this prior apt patent, inherently limits the burning temperature because cold air has to be mixed with the smoke containing gases to lower their temperatures so that the blower would not be damaged. A blower, since it has moving parts, inherently should operate at relatively low ambient temperatures.

OBJECTS OF THE INVENTION

An important object of this invention is to produce a smokeless incinerator wherein burnable material may be burned without producing objectionable smoke.

Another object is to provide, with an incinerator, a removable means that can be removeably attached to the firebox, preferably formed by the steel shell of a freight car and which means can recirculate the exhaust gases back into the firebox for reburning.

Another object of this invention is to provide with an incinerator, a means for recirculating exhaust gases back into the firebox and which means allows the gases to circulate at their maximum temperatures.

Another object of this invention is to provide, with an incinerator, a means for recirculating exhaust gases back into the firebox which means allows secondary air to be mixed with the gases exhausting from the firebox to cause further burning.

These and other objects and features of advantage will become more apparent after studying the description of the preferred embodiment together with the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a plan view of a railroad box car with a portion of the roof broken away and the car is in combination with my novel means for recirculating hot exhaust gases.

FIG. 2 is a front elevation of the box car and the novel means.

FIG. 3 is an elevation, cross-section of the box car and the novel means taken on broken line 3—3 in FIG. 2 and in the direction of the arrows.

FIG. 4 is an end elevation view of the box car and the novel means taken from the left as viewed in FIG. 2.

DETAILED DESCRIPTION OF THE DRAWINGS

Referring to the drawings and, in particular, to FIGS. 1 and 2, there is shown a railroad box car 10 resting upright on the ground 11. The trucks (not shown) for the boxcar have been previously removed for reuse. The box car has been discarded by the owner for any number of reasons such as the car requires extensive repairs to make it serviceable. The box car 10 normally consists of a steel shell, as more clearly shown in FIG. 3. The steel shell would have a bottom plate 12, resting on the ground 11, back plate 13, (FIG. 1) front and side plates 14 and roof plate 15 suitably welded together with the required stiffening members (not shown). The inside of the box car 10 is lined with wood 16 for well-known reasons or with insulation (not shown), if the box car is a refrigerator car. Since the box car 10 is discarded, one would normally try to reclaim the materials and recycle them, for many reasons, the main one of which would be to save the ecology. Since the wood 16 is tightly fitted in place within the box car, present day methods do not allow one to remove the wood or insulation without damage, thus making them worthless, and this operation costly. A more feasible method would be to burn the wood and insulation to reclaim the steel. Since the box car has normally only one opening which is a door 17 formed in the front plate 14, openings have to be formed in the roof plate 15 to provide ventilation for the fire within the box car 10. However, excessive smoke has been produced which pollutes the environment.

I have invented a novel means that provides ventilation and circulation for the exhaust gases which means allows the fire to burn at a sufficient high temperature

so that substantially no smoke is produced and exhausted into the atmosphere. Since ventilation holes are required in the box car for burning, I prefer to form holes in the roof preferably near the ends of the car **10**, as shown by an opening **19** in FIG. **3**. Although opening **19** is located near the right end of the car **10**, as viewed in FIGS. **1** and **2**, a similar opening (not shown) is formed in the left side of the car **10**. Over the openings are placed hoods **21** and **22**. i.e., hood **21** over opening **19**, and hood **22** over the other opening. The hoods **21** and **22** have sloping walls that converge, to smoke pipes **23** and **24**, respectively, which both rise up a short distance, then extend forward to the front of the box car **10** and drop down in front thereof, as more clearly shown in FIG. **4**. Then pipe **23** bends to the left and pipe **24** bends to the right, as viewed in FIG. **2**, toward the center of the box car **10**, where both pipes **23** and **24** turn inward and extend inside the door **17**, as shown in FIG. **1**. Inside the car **10**, pipe **23** bends right and pipe **24** bends left, for reasons that will be explained hereinafter.

To reinforce the pipes **23** and **24**, and the hoods **21** and **22**, so that they can be moved from place to place readily, I have provided a convenient frame made of two long channels **26** and **27** connected at their ends to two short channels **28** and **29**. Channels **27**, **28** and **29** are fixed to hoods **21** and **22**, as shown, while the downward extended portions **23***a* and **24***a* of pipes **23** and **24**, respectively, are connected to channel **26** by suitable straps **30**. Within the periphery formed by channels **26**, **27**, **28** and **29** are disposed additional channel **31** for strength and rigidity. In addition, closing a portion of the door **17** and leaving a port **17**a for exhausting smokeless gases, is a plate **32** having suitable openings **33** and **34** (FIG. **2**) through which the inwardly extending portions **23***b* and **24***b* of pipes **23** and **24**, respectively, protrude and are fixed thereto. The novel unit comprising hoods **21** and **22**, pipes **23** and **24**, the respective channels **26**, **27**, **28**, **29** and **31**, the straps **30**, and the plate **32**, is preferably made of steel and welded together because steel is nonflammable and economical. The unit can be lifted by a crane and moved from box car to box car as required. In addition, for rigidity, an angle stiffener **35** (FIG. **3**) is placed around plate **32** so that the angle stiffener **35** extends within the door **17**, thereby providing a bearing surface **36** for the unit on the door **17**.

The prior art, as mentioned above, teaches that to reduce smoke emission, the exhaust gases should be recirculated through the fire box which, in my case, is now the box car **10**. However, to substantially eliminate smoke, a very hot fire is required and the blower systems of the prior art inherently limits the burning temperature. In my invention, I have provided at least two features which allow the fire to attain higher temperatures than in the prior art. Each wood **21** and **22** is so constructed that an opening **41** is provided between the respective hood and the roof plate **15** when the hoods rest on the plate **15**. This opening **41** allows air to mix within the hoods with the gases exhausting from the opening **19** in the roof plate **15** and further burn the gases. This air is normally referred to as secondary air, and, since the exhaust gases are further oxidized, they increase in temperature. Then, to maintain this high temperature within the exhaust gases, I have novelly employed a venturi type pump to circulate the hot exhaust gases through pipes **23** and **24** and back into the fire box. The venturi type pump is shown in detail in FIG. **3**. The pump includes a nozzle **42** that is disposed within the inwardly directed portion **23***b* of pipe **23**. Although the venturi type pump within pipe **23** is only explained, a similar pump is disclosed within the portion **24***b* of pipe **24**. The throat or opening of nozzle **42** is directed also into the car **10**. The other end of the nozzle **42** is connected to a standard centrifugal blower **43**. The blower **43** sucks cold ambient air to force primary air into the nozzle **42** which directs the air into the car **10**. In so doing, the primary air draws the hot exhaust gases through the pipe **23** back into the car **10**. To insure that minimum smoke exhausts out of the port **17***a*, the pipe **23** is provided, as mentioned above, with an elbow **23***c* to direct the mixture away from the opening **17***a*. The opening of the nozzle **42** can be made relatively small so that low volume and high velocity air exits therefrom, in turn causing large volumes of and very hot exhausts gases to be conducted through the pipe **23** and mix with relatively low quantities of primary air. Since my blower **43** and my other blower **44** in pipe **24** inherently operates at low temperature, the quantity of primary air needed to be supplied in my invention is no more than the amount required to support combustion thereby increasing the burning temperature over methods taught by the prior art. In fact, the exhaust gases passing around the nozzles could be at a sufficiently high temperature to cause ignition of any unburned compounds therein when they are mixed with the primary air. The pipe **23**, since it has the elbow **23***c* within the car, directs the mixture of gases to the end of the car away from opening **17***a* so that the smoke laden gases have time to burn before they can migrate out of the port **17***a*. The gases leaving port **17***a* are visibly free of smoke.

The novel combination is used as follows: Openings such as opening **19** are formed in the roof of the box car near the ends thereof. The unit, consisting of the hoods **21** and **22**, pipes **23** and **24**, etc., is lifted and set against the car **10** as shown in the drawings. An oil-burning **51**, which I have installed on plate **32**, is lighted to shoot flames into the car **10**. The oil burning is for convenience only. Other methods of starting the burning process may be used. However, I have found that the oil burner reduces the amount of start-up smoke, over other methods. The blowers, such as the blower **43** in pipe **23** and as blower **44** in pipe **24**, are started. The partially burned exhaust gages primarily rise up through the roof openings and are captured by the hoods and sucked back into the car **10**. As the circulation increases, the temperatures within the car increases, and in a very short time no visible smoke is seen exiting from port **17***a* or the upper part of the door **17**. The burning continues until the combustible material is consumed.

However, if one desires to convert the setup to an incinerator to burn other materials, feed holes would be found in the box car to introduce the burnable materials. Preferably, the feed holes would be through the side wall thereof, such as shown by dotted line **52** (FIG. **4**).

Having described my invention by way of the preferred embodiment, I do not consider my invention is limited to the disclosed embodiment but includes all embodiments falling within the scope of the appended claims.

I claim:

1. A smokeless incinerator comprising
a fire box with first and second openings and forming exhaust gases when a fire is therein,
first means for conducting substantially all of the exhaust gases exiting from said first opening back into said fire box,
second means for allowing air to be mixed with the exhaust gases while in said first means at a temperature to allow further burning of the exhaust gases, and
said second opening being spaced from said first opening for allowing the combustion products to pass out into the atmosphere,
said first opening being located higher than said second opening and the point where the exhaust gases are returned to the fire box,
said second opening being further disposed near the point where the exhaust gases are returned to the fire box, and
said first means including a pipe section disposed within said fire box to direct the gases passing therethrough toward said first opening.

2. A smokeless incinerator comprising
a fire box with first and second openings and forming exhaust gases when a fire is therein,
first means for conducting substantially all of the exhaust gases exiting from said first opening back into said fire box,
second means for allowing air to be mixed with the exhaust gases while in said first means at a temperature to allow further burning of the exhaust gases,
said second opening being spaced from said first opening for allowing the combustion products to pass out into the atmosphere,
said second means including a nozzle for accelerating air to a relatively high velocity and a fan for supplying the air to said nozzle,
said first means including a pipe through which said exhaust gases pass,
said nozzle being disposed within said pipe to direct the air in the direction to cause the exhaust gases to enter said fire box,
said second means including another opening in said first means located between said fire box and said nozzle to cause further combustion of the exhaust gases,
said first opening being located higher than said second opening and the point where the exhaust gases are returned to the fire box,
said second opening being disposed near the point where the exhaust gases are returned to the fire box, and
said first means includes a pipe section disposed within said fire box to direct the gases passing therethrough toward said first opening.

3. The incinerator of claim 2 wherein
said fire box is elongated with said first opening formed in the roof thereof at one end and another first opening formed in the roof at the other end,
said second opening is formed in one of the longer sides at the center thereof,
said first means conducts the exhaust gases therein through said second opening near the bottom of the opening, leaving the combustion products to discharge through the top of the second opening.

* * * * *