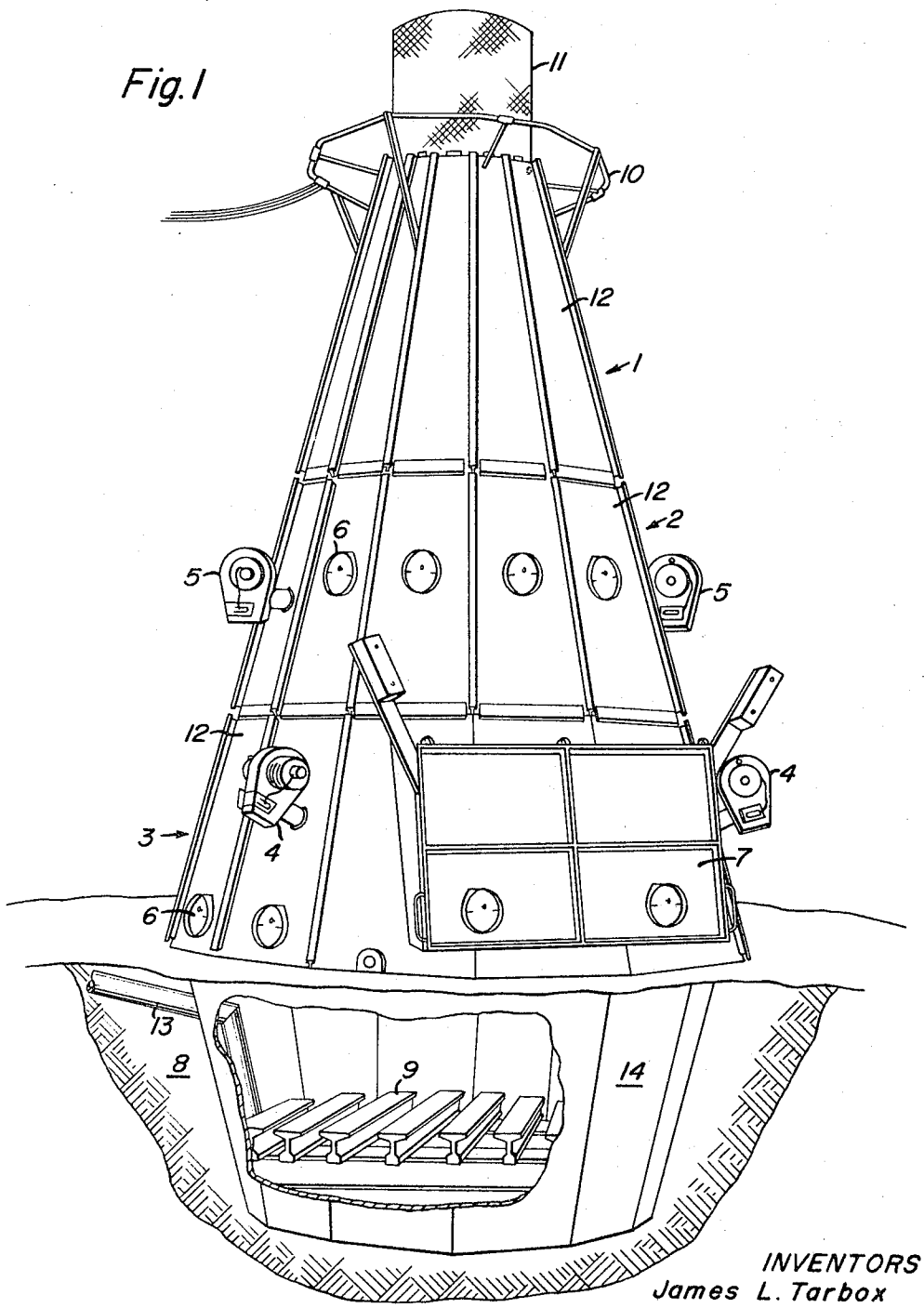
July 1, 1969 J. L. TARBOX ET AL 3,452,690

FIELD EXPEDIENT RADIOACTIVE WASTE INCINERATOR

Filed Dec. 8, 1967 Sheet 1 of 2

Fig. 1



INVENTORS
James L. Tarbox
David G. Lachapelle

BY Harry M. Saragovitz,
Edward J. Kelly, Herbert Berl
& Bernard J. Ohlendorf ATTORNEYS

July 1, 1969 J. L. TARBOX ET AL 3,452,690

FIELD EXPEDIENT RADIOACTIVE WASTE INCINERATOR

Filed Dec. 8, 1967 Sheet 2 of 2

Fig. 2

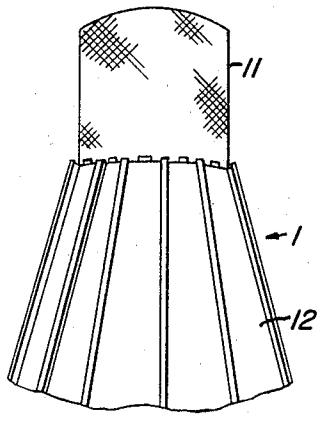
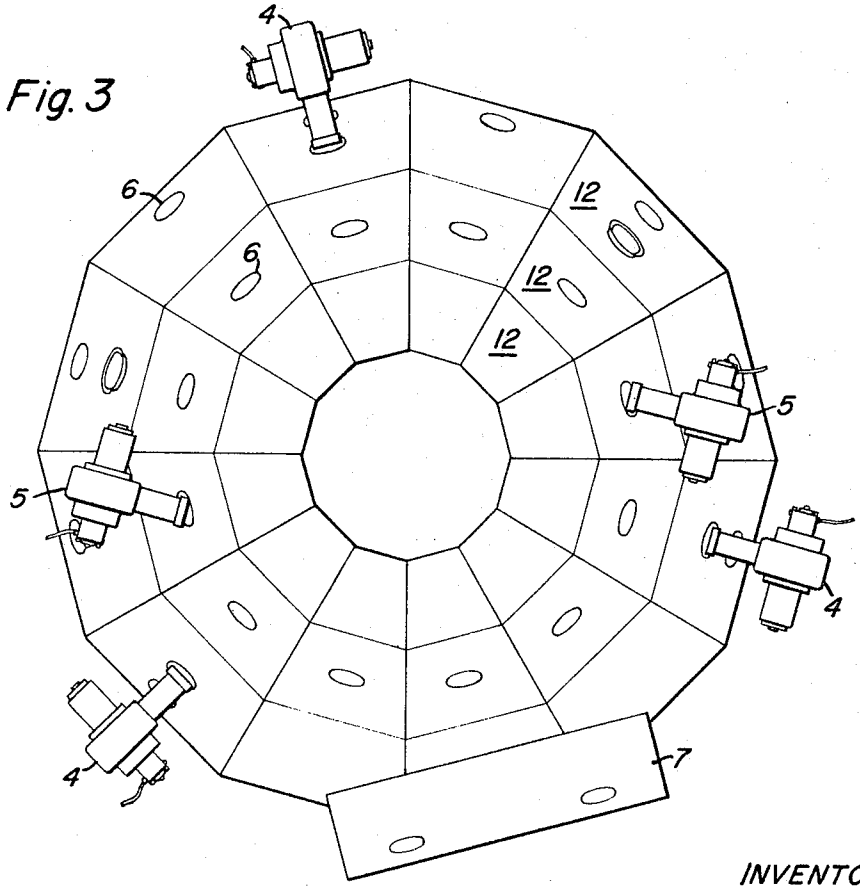


Fig. 3



INVENTORS
James L. Tarbox
David G. Lachapelle

BY Harry M. Saragovitz
Edward J. Kelly, Herbert Berl
& Bernard J. Ohlendorf ATTORNEYS

United States Patent Office

3,452,690

Patented July 1, 1969

3,452,690

FIELD EXPEDIENT RADIOACTIVE WASTE INCINERATOR

James L. Tarbox, Towson, and David G. Lachapelle, Joppa, Md., assignors to the United States of America as represented by the Secretary of the Army

Filed Dec. 8, 1967, Ser. No. 689,194
Int. Cl. G21f 9/14, 9/32; F23g 9/00
U.S. Cl. 110—7 7 Claims

ABSTRACT OF THE DISCLOSURE

A portable incinerator for efficient and economical concentration and disposal of combustible radioactive waste comprising an ash pit; three tiers or sections having steel panels in each tier, the panels being bolted together and the tiers nested within each other and located over the ash pit; primary burners located in the lower tier; secondary burners located in the center tier; dampers located in the lower and middle tiers; and a spark arrester.

The invention described herein may be manufactured, used, and licensed by or for the Government for governmental purposes without the payment to us of any royalty thereon.

Our invention relates to a portable incinerator for disposal of combustible radioactive waste.

The advent of nuclear activities has necessitated incineration as a means of disposing of combustible radioactive waste. To appreciate the need for a portable incinerator, one need only consider the event of a large scale radioactive contamination resulting from an accidental release of radioactivity as through a weapons accident or from enemy action which would result in many radioactive contaminated combustible structures, such as buildings and materials, which could be effectively disposed of, to remove the radioactivity hazard, through means of portable incinerators erected at the contaminated site in a few man-hours.

Paramount in the incineration of contaminated combustible materials is the confinement of as much of the radioactivity in the incinerator as is possible. It is essential that the environment be polluted to an absolute minimum during the burning operation. Also, in an emergency situation, it must be possible to set the incinerator up quickly, efficiently, and economically. Considerable development work had been done on incinerators capable of burning radioactive wastes prior to our invention. However, all of these incinerators, such as described and shown in U.S. patent application of James L. Tarbox, Ser. No. 652,636 filed on July 11, 1967, were large, complicated, fixed installation type incinerators which were not adaptable for portable use.

The above discussed problem led to the concept and reduction to practice of our efficient, economical, quickly assembled, and portable incinerator.

A principal object of our invention is to design, construct, and operate a portable combustible radioactive waste incinerator which can be quickly assembled and placed in efficient operation and produce minimum pollution to the environment resulting in a minimum health hazard.

A further object of our invention is to design, construct, and operate an efficient portable combustible radioactive waste incinerator which is economical.

Other objects of our invention will be obvious or will appear from the specification hereinafter set forth.

After our portable incinerator was designed and constructed, it was tested for efficiency of operation and minimal radioactive contamination to the atmosphere by four separate burns in which the incinerator charge was oak lumber coated with radioactive material as follows:

Burn I

Approximately 0.169 curie of lanthanum-140 tagged particles ranging from 75–150 microns were affixed to the lumber.

Burn II

Approximately 0.213 curie of lanthanum-140 in solution was brushed onto the lumber.

Burn III

Approximately 2.082 curie of lanthanum-140 tagged particles ranging from 20–75 microns were dusted over the lumber.

Burn IV

Approximately 1.822 curie of lanthanum-140 in solution was brushed onto the lumber.

The results of these burns as determined from air samples demonstrated a highly efficient burning operation with minimal release of radioactivity to the atmosphere. The following table tabulates the results:

TABLE.—RESUME OF INCINERATION TESTS

Burn No.	Date, 1966	Time		Contamination type	Amount of contamination applied	Activity applied, curie	Weight (lb.)		Activity (curie)	
		Start	End				Lumber	Ash	Ash	Effluent
I	22 Oct	0923	1245	Solid, 75-150μ simulant hand spreader used.	12 lb	0.169	2,000	22.5	0.122γ	0.00002
II	31 Oct	0943	1333	Liquid, $LaCl_3$ in acid solution.	4 gal	0.213	2,000	17.5	0.187γ 0.170β	0.00307
III	4 Nov	1445	1740	Solid, 20-75μ simulant vortex dispenser used.	1 lb	2.082	2,000	17.0	1.53γ 1.12β	0.00302
IV	10 Nov	1100	1430	Liquid, $LaCl_3$ in acid solution.	4 gal	1.833	2,000	12.5	0.515γ 0.424β	0.02730

FIGURE 1 is a view of the assembled portable incinerator.

FIGURE 2 is a view of the spark arrester and top of the incinerator with the instrumentation mounting structure removed.

FIGURE 3 is a top view of the incinerator shown in FIGURE 1.

Our invention and FIGURES 1 to 3 will now be described in detail as follows:

FIGURE 1 shows our portable combustible radioactive waste incinerator comprising three tiers or sections, **1**, **2**, and **3**, nesting within and held within each other by the tier's own weight. Each tier comprises 12 panels, character **12** in the drawing, fabricated from standard four by eight foot steel plate, 3/16 inch thick; the panels being bolted together and having the geometrical configuration of a twelve sided truncated cone. When assembled, the three tiers have a base diameter of about ten feet, a top diameter of about three feet, and a total height of about thirteen feet. Mounted on top of the three tiers is a three

foot high cylindrically shaped screen structure of 12 gauge locomotive netting, 11 gauge woven wire 4 x 4 openings per inch, **11**, which serves as a spark arrester, during the burning operation. Three oil-fired burners, **4**, are located in the primary tier, **3**, at a height of two feet above the ground on 120° centers and fired toward the center of the pit, **8**, at an angle of about 30° downward, relative to the horizontal plane. Two oil-fired burners, **5**, are mounted in secondary tier, **2**, at a height of five and two-thirds feet above the ground, on 180° centers, and offset from each other as shown in FIGURE 3. The purpose of the offset arrangement being to induce tangential flow and produce more efficient combustion of the gases. Dampers, **6**, are provided in all panels of the lower two sections to provide both excess air for combustion and cooling air for the walls of the incinerator. Structure **10** is merely a mounting structure for instrumentation used in testing the efficiency of operation, and structure **10** is not necessary to the operation of our incinerator as shown in FIGURE 2, but could be utilized to test efficiency of operation when desired. Door, **7**, is provided to place the combustible radioactive waste charge within the incinerator to be burned. When assembled, the three tiers are located over a four foot deep ash pit, **8**, lined with a steel basin, **14**; the pit having a top diameter of about nine feet and a base diameter of about 6 feet. The pit is merely a hole dug in the ground at the contaminated site. As can readily be seen, when the burning operation is completed the incinerator can be collapsed into the pit, and the pit closed with earth due to economical cost of the incinerator component parts and materials. The pit is provided with a grate, **9**, fabricated from railroad rail and a six inch diameter pipe, **13**, for externally supplied forced air draft. The oil-fired burners **4** and **5** are conventional commercially available units such as utilized in home heating systems. Each of the burners has a continuous ignition, not shown in the drawing, and an oil recycle system, not shown in the drawing. A common motor, not shown in the drawing, on each burner drives both the air blower section, not shown in the drawing, and the oil pump, not showing in the drawing, and the ignition system is electrically independent of the blower-pump section. With the ignition off and the blower-pump section operating, fuel is recycled from a fuel storage tank, not shown in the drawing, through the oil pump and discharges through a solenoid valve, not shown in the drawing, back to the fuel storage tank. This recycle system was necessary due to the type of oil pump utilized, a pump which utilized the fuel as a pump lubricant. Also, with the ignition off, the burner units can be used as a source of overfire combustion air. In operation, primary burners, **4**, are used in the firing mode until the charge of combustible radioactive waste begins to burn freely by itself. When free burning of the charge begins, the primary ignitions are switched off and primary burners, **4**, utilized for overfire air supply only. The two secondary burners, **5**, are fired continuously for the duration of the burning operation and serve as after burners to minimize discharge of any unburned radioactive material that might rise from the primary combustion section **3**. As mentioned above, combustion air and surface cooling was provided by damper means, **6**. Underfire air was supplied through six inch ducting, **13**, connected

to a centrifugal blower, not shown in the drawing, having a capacity of 570 c.f.m.

It is obvious that other modifications can be made of our invention, and we desire to be limited only by the scope of the appended claims.

We claim:

1. A portable combustible radioactive waste incinerator comprising a first lower section; a second center section; a third upper section; each section comprising a number of panels assembled together; said sections being nested together; a spark arrester nested within said third section; a door within said first section to place a radioactive charge within the incinerator; burner means mounted within said first section to ignite said charge; damper means within said first and second section to provide combustion air and surface cooling air; burner means within said second section to function as after burners; said first, second, and third sections being mounted over a pit means; grate means within said pit means; forced draft means to supply air to said pit means; means to supply fuel to said burners, and means to start said burners.

2. The incinerator of claim **1** wherein said panels are twelve in number and are bolted together.

3. The incinerator of claim **1** wherein the spark arrester is of cylindrical construction and of locomotive netting material.

4. The incinerator of claim **1** wherein the grate means are railroad rails.

5. The incinerator of claim **1** wherein the pit means includes a hole in ground.

6. The incinerator of claim **1** wherein the fuel supply means is a recycle system.

7. A method of disposing of combustible radioactive waste material comprising the steps of digging a hole in the ground at the site of the radioactive contamination; lining the hole with a steel basin to form a lined pit; providing the lined pit with a grate means on the bottom of said pit; providing forced externally supplied air beneath said grate; providing a number of panels; assembling the panels together in three separate conically shaped sections; nesting the three sections within each other to form a lower, center, and upper section structure; placing the nested sections over said pit; providing the lower section with a charge door; providing the lower and center sections with burner and damper means; providing the upper section with a spark arrester means; charging the pit with a supply of combustible radioactive waste; burning said waste; collapsing said three sections into said pit when burning is completed; replacing the earth in the hole which was utilized as the pit.

References Cited

UNITED STATES PATENTS

1,776,914	9/1930	Langford.	
3,137,253	6/1964	Clayton	110—18 X
3,149,598	9/1964	Rees et al.	110—18 X

JAMES W. WESTHAVER, *Primary Examiner.*

U.S. Cl. X.R.

110—18