Sept. 24, 1974 R. I. BUCHBINDER ET AL 3,838,015

METHOD AND APPARATUS FOR PYROLYTIC DECOMPOSITION OF TRASH

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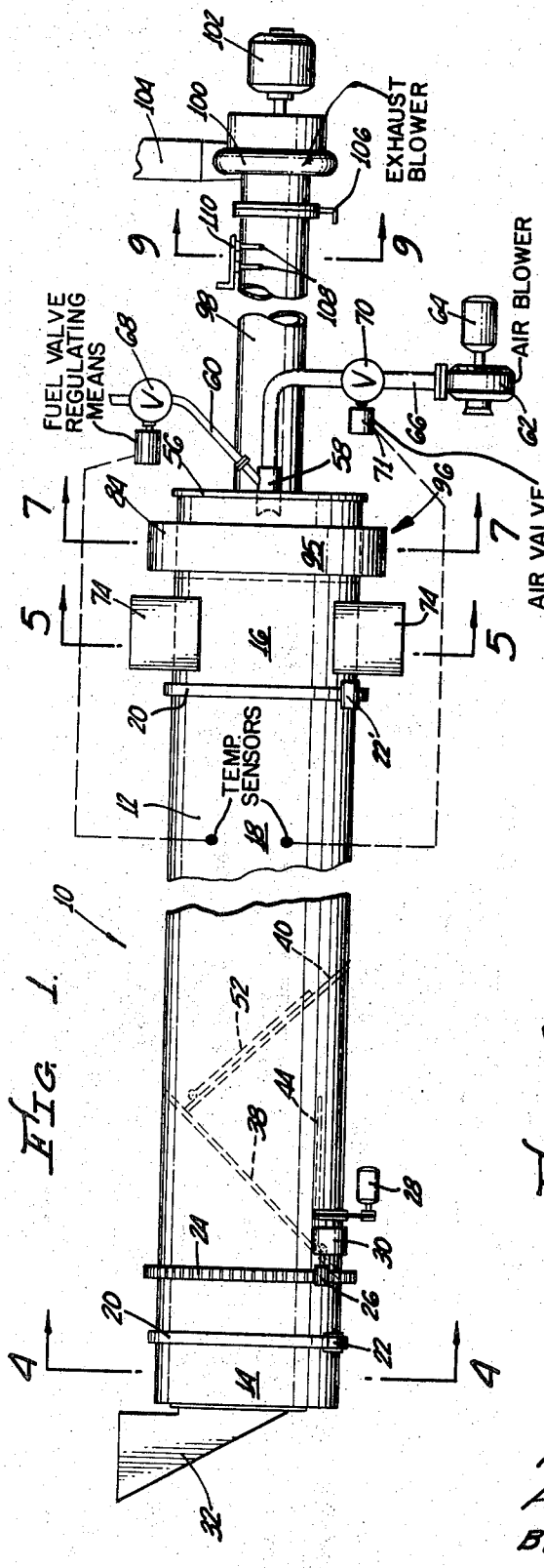


FIG. 1.

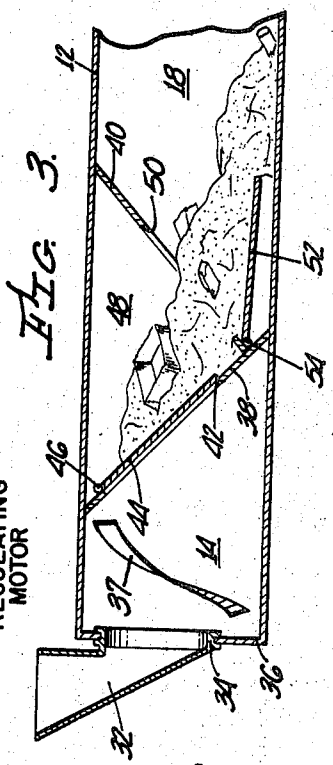


FIG. 3.

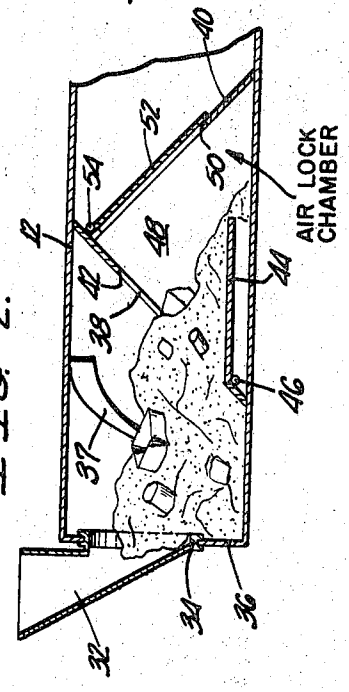


FIG. 2.

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FIG. 4.

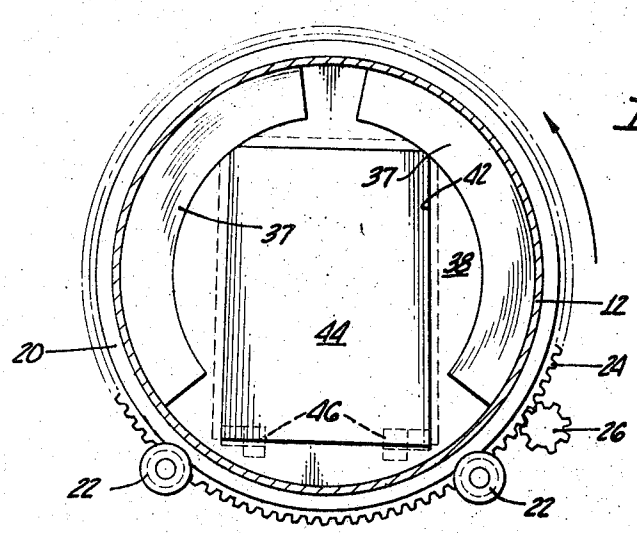


FIG. 5.

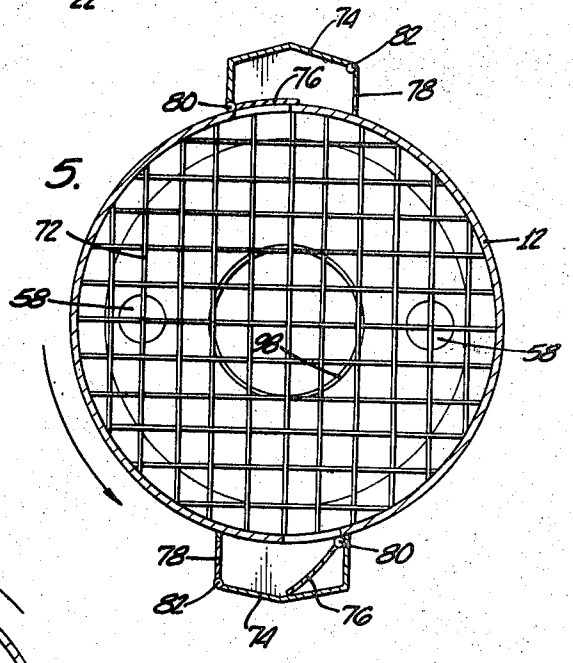
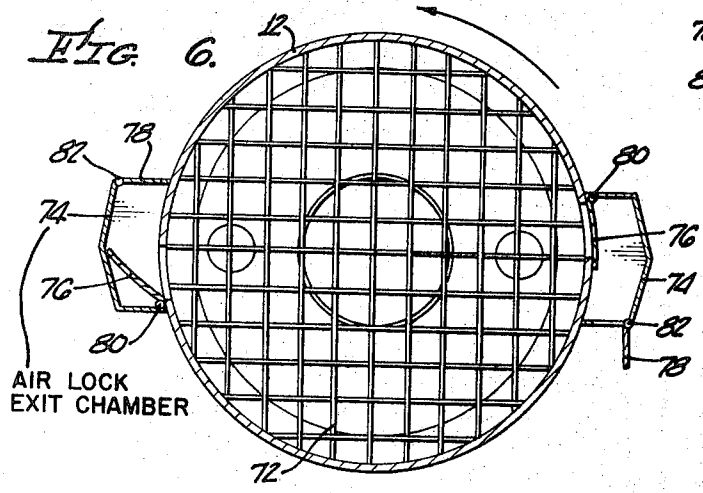


FIG. 6.



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FIG. 7.

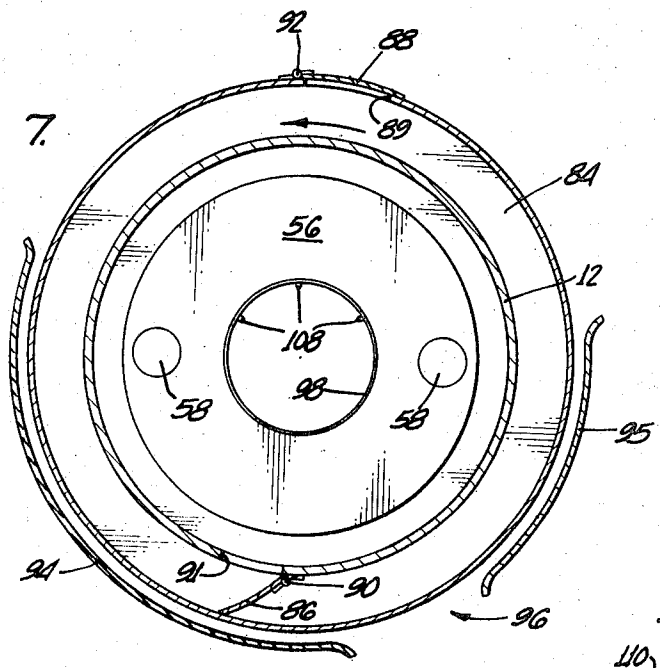


FIG. 9.

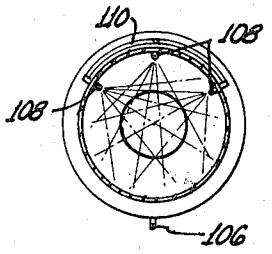
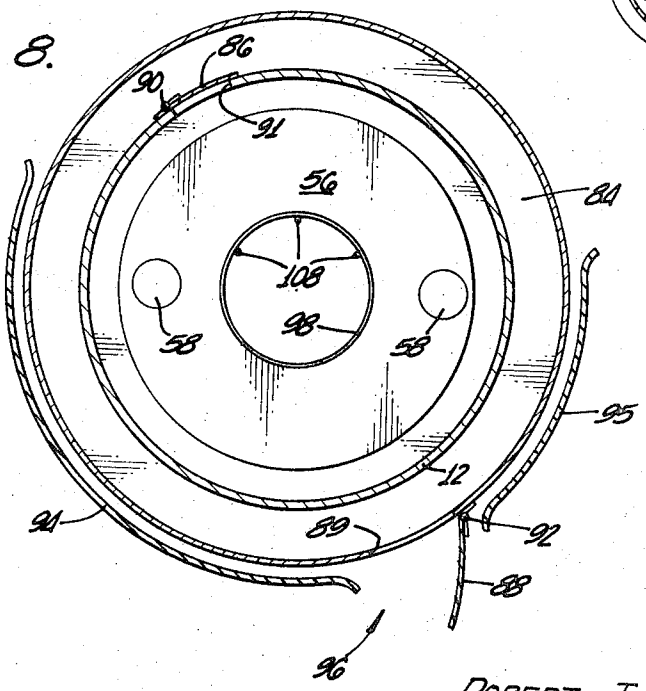


FIG. 8.



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3,838,015

METHOD AND APPARATUS FOR PYROLYTIC DECOMPOSITION OF TRASH

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Continuation of abandoned application Ser. No. 73,116, Sept. 17, 1970. This application Sept. 20, 1972, Ser. No. 290,754

Int. Cl. C10b *49/06, 53/00*

U.S. Cl. 201—1 16 Claims

ABSTRACT OF THE DISCLOSURE

Industrial and municipal trash is fed into one end of a rotatably supported, elongated drum, which turns at a relatively slow rate of rotation, and the carbonized residue is discharged from the other end. Trapdoor arrangements at the entrance and exit ends allow material to be fed into and discharged from the drum as the latter revolves, without opening the interior of the drum to the atmosphere. Internal gas burners at one end of the drum are operated at the start of operations to heat up the drum and contents to high temperature, causing destructive distillation of carbonaceous material with resultant production of combustible gas. Fuel supply to the burners is then cut off and air is admitted through burners at a controlled rate to maintain combustion of gases within the interior of the drum to the extent required to sustain operating temperatures. Excess unburned gas is exhausted and cooled, and volatile liquids are condensed out.

This is a continuation application of application Ser. No. 73,116, filed Sept. 17, 1970, and now abandoned.

BACKGROUND OF THE INVENTION

The present invention pertains to apparatus for the pyrolytic decomposition of the organic or combustible material in municipal and industrial trash, so as to reduce the same to a charred residue having only about 10–20% of its original bulk. At the same time, the combustible gas generated by the apparatus is utilized to maintain the elevated temperatures required, thus making the pyrolytic process substantially self-sustaining.

The tremendous bulk of municipal and industrial trash that is generated daily in our larger cities makes it essential that some effective and economical means be found for disposing of the same without polluting the atmosphere or otherwise producing offensive discharges. In order to reduce the bulk of such trash, it has long been the practice to burn the trash at the city dump. This results in the creation of a pall of offensive, odorous smoke, and such open burning is now prohibited by law in most parts of the country. Other methods of disposing of trash are by incineration and sanitary landfill. Incineration has the serious problem of air pollution, which is extremely expensive to overcome. Sanitary landfill becomes increasingly more difficult as a municipality grows larger, because of the unavailability of land near the population centers.

To eliminate the smoke problem, it has heretofore been proposed to burn the trash in a rotating drum, or retort, which is heated by external burners, so that the trash contained within the drum is reduced to char by destructive distillation, while combustible gas generated by the process is drawn off by blowers and mixed with the fuel gas and oxygen going to the said burners, to provide fuel for the latter. The chief disadvantage of this arrangement is that with the burners on the outside of the drum and the trash on the inside thereof, it is necessary that all of the heat generated by the burners be conducted

through the walls of the drum, or retort, which results in rapid deterioriation of the drum walls due to prolonged exposure to very high temperatures. Using steel in the drum construction, it is necessary to limit temperatures to 1000° F. or less, as the structural strength of the steel is adversely affected by temperatures in excess of 1000° F. In such prior apparatus, it is not possible to line the interior of the retort with refractory material, as this would act as a heat barrier, and would prevent transmission of the heat by conduction from the external flame to the material contained within the retort. The relatively low operating temperature (i.e., less than 1000° F.) inside the drum has had the effect of reducing the rate-of-flow capacity of such devices to an inefficient level.

SUMMARY OF THE INVENTION

The primary object of the present invention is to provide a new and improved apparatus for the pyrolytic decomposition of municipal and/or industrial trash to reduce the organic and combustible content of the same to a charred residue, without producing objectionable smoke or odors or other environment pollutant discharge. The charred residue, reduced to only 10 to 20% of its original bulk and now completely inorganic and biologically stable, can be disposed of by cut-and-fill operations or by dumping at sea, as the case may be.

Another object of the invention is to provide an apparatus of the class described which is thermally self-sustaining, after being brought up to operating temperature, by using the combustible gas produced by destructive distillation of carbonaceous material in the trash to generate the heat necessary to sustain the pyrolytic process.

A further object of the invention is to provide a trash-reducing apparatus in which the combusion takes place within the retort, instead of externally thereof. The primary advantage of this feature is that it permits lining the interior of the retort with refractory material so that the steel walls of the drum are protected from the high temperature flame and therefore are kept from being heated to such high temperatures as to affect the strength of the steel, while at the same time, the operating temperature within the restort is raised several hundred degrees higher than the 1000° F. maximum that has heretofore been allowable, with corresponding increase in efficiency and rate flows.

These and other objects and advantages of the invention will become apparent to those skilled in the art upon consideration of the following detailed description of the preferred embodiment thereof, with reference to the accompanying drawings.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevational view of an apparatus embodying the principles of the invention;

FIG. 2 is a cut-away, fragmentary view of the inlet end of the apparatus shown in FIG. 1;

FIG. 3 is a view similar to FIG. 2, showing the drum revolved through 180° from the position of FIG. 2;

FIG. 4 is a sectional view, drawn to somewhat larger scale, taken at 4—4 in FIG. 1;

FIG. 5 is a sectional view, also drawn to a larger scale, taken at 5—5 in FIG. 1;

FIG. 6 is a view similar to FIG. 5, showing the drum turned 90° from the position of FIG. 5;

FIG. 7 is an enlarged sectional view taken at 7—7 in FIG. 1;

FIG. 8 is a view similar to FIG. 7, but showing the drum turned through an angle of about 120° from the position of FIG. 7; and

FIG. 9 is a sectional view taken at 9—9 in FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In the drawings, the device of the invention is designated in its entirety by the reference numeral **10** and comprises an elongated, cylindrical drum **12**, preferably made of steel plate, which is supported for rotation about an approximately horizontal axis. The drum **12** has an entrance end **14**, an exit end **16**, and an intermediate section **18** in which pyrolytic decomposition of the trash takes place.

Fixed to the outside of the drum and encircling the same near each end thereof are circular steel tires **20**, each of which rests on a pair of horizontally spaced-apart wheels **22** and **22'** (FIGS. 1 and 4) which are rotatably mounted on suitable supporting structures. Wheels **22** have radial flanges at each end which pass on opposite sides of their respective tire **20** to restrain the latter and that end of the drum, as well, against endwise movement. Wheels **22'**, however, are straight-sided, cylindrical rollers that allow their tire **20** to slide endwise over them as the drum expands and contracts in length from heating and cooling.

Also fixed to the outside of the drum **12** and extending around the circumference thereof is a ring gear 24, which has a small pinion **26** meshed therewith. Pinion **26** is driven by motor **28** through a speed reduction gear box **30**. The drum **12** is normally driven at a speed of about 3 revolutions per minute.

At the entrance end of the drum is a feed hopper **32**, the bottom end of which opens through a circular opening **34** in the end wall **36** of the drum. Spiral flights **37** (FIG. 4) are attached to the inner surface of the drum just inside the end wall **36**, and these serve to pick up the material and move it endwise along the drum in the direction away from the feed hopper **32** and toward the pyrolyzing section **18**. Fixed to the inside of the drum **12** beyond the ends of the spiral conveyor flights **37**, and completely spanning the interior thereof, are two bulkheads **33** and **40**, which are arranged at an angle to one another, as best shown in FIGS. 2 and 3. The first bulkhead **38** extends from a point just inside the drum front end closure **36**, and its plane forms an angle of about 30° to the longitudinal axis of the drum. The second bulkhead **40** is shown at an angle of about 45° to the axis of the drum, and slopes in the opposite direction. Bulkhead **38** has an opening **42** which is closed by a door **44** that is hinged to the edge of opening **42** that is nearest the wall of the drum. Thus, when the drum is turned to the position shown in FIG. 2, the door **44** drops open by gravity to the position shown, and trash contained within the entrance end of the drum is allowed to fall into a transfer chamber **48** defined between bulkheads **38** and **40**.

Bulkhead **40** has an opening **50** provided therein which is offset in the opposite direction from opening **42**, so that it is substantially diametrically opposite from the latter with respect to the axis of rotation of the drum. Opening **50** is closed by a door **52**, which is hinged at **54** to that edge of the opening that is closest to the wall of the drum. Thus, when the drum has turned 180° from the position shown in FIG. 2, so that it has the position shown in FIG. 3, the door **52** drops open by gravity, and trash contained within the transfer compartment **48** is allowed to tumble out of the compartment into the midsection **18** of the drum, where pyrolytic decomposition takes place.

In the midsection **18** of the drum are lifters (not shown) which may be in the form of straight blades, or paddles, projecting radially inward for a short distance from the inner surface of the drum, and these pick up the trash as the drum revolves and then drop it to the bottom, thereby breaking up the material and helping to preheat it uniformly throughout its mass by cascading the material in the hot pyrolyzing section. The lifters also help to move the material endwise through the pyrolyzing section and toward the exit end of the drum.

The exit end **16** of the drum is closed by a stationary end plate **56**, which is sealed to the drum so that the latter can revolve with respect to the stationary end plate without allowing air to get into or out of the drum. Projecting into the interior of the drum through the end plate **56** on opposite sides of center are two burner nozzles **58**. These nozzles are supplied with fuel gas through a fuel pipe **60**, and are also supplied with air for combustion of the gas by means of a blower **62**, driven by a motor **64**, the said blower delivering its air to the nozzles through pipes **66**. A valve **68** in the fuel line **60** controls the flow of fuel to the nozzles, while a second, motor-actuated valve **70** in the air line **66** controls the flow of air to the burners. Valve **70** is controlled by a reversible electric motor **71**.

The burners **58** shoot long tongues of flame into the interior of the drum **12**, heating up the drum and its contents to a temperature of at least approximately 1100° F. During this initial heating stage, the supply of oxygen admitted to the interior of the drum **12** is limited to the bare minimum required to support combustion of the fuel delivered to the burner nozzles **58**, and as a result, the trash within the drum does not burn, but begins to undergo destructive distillation. By the time the temperature of the interior of the drum has reached 1100° F, all of the oxygen that was initially contained within the drum has been used up and the drum becomes filled with combustible gas produced by the destructive distillation of the carbonaceous material in the trash. Upon reaching 1100 F., the fuel supply is shut off, and oxygen is admitted in an amount just sufficient to support combustion of part of the combustible gas within the drum. This combustion of the gas produced by the distillation of trash produces enough heat to sustain the pyrolytic decomposition of the trash without the necessity of supplying any additional fuel to the burner nozzles, and the process is thereafter self-sustaining as long as a continuous supply of trash is fed into the hopper **32** at the entrance end of the drum.

As the drum continues to rotate, the material in the intermediate section thereof works its way down toward the exit end **16**, preferably aided by gravity, which is made effective by mounting the drum with its axis at a very slight inclination to the horizontal.

Extending completely across the interior of the drum, near the exit end **16** thereof, is a screen **72** of stainless steel or other heat-resistant material, which functions to prevent any large pieces of non-combustible material such as metal, glass, chunks of concrete or dirt, or the like, from passing down to the extreme end of the drum where the charred combustible material is discharged. At the same time, the flames from the burners **58**, and burning gases released by the combustible material in the pyrolyzing zone pass freely through the screen.

The large pieces of non-combustible material separated out by the screen trap **72** are discharged from the drum by the means shown in FIG. 5 and 6. In these two figures, the drum is seen to have two discharge chambers **74**, mounted on diametrically opposite sides of the drum. Each of these chambers has an entrance door **76** and an exit door **78**. Door **76** is hinged along one edge at **80**, while door **78** is hinged along one of its edges at **82**, to the trailing side of the chamber **74**. In FIGS. 4–8, the drum is rotating in the counter-clockwise direction, as shown by the arrows. The arrangement for the doors and their respective hinges is such that when the discharge chambers **74** are at the top of the drum, or at the lefthand side as viewed in FIGS. 5 and 6, both doors are held in place by gravity. As the discharge chamber reaches the bottom of the drum, door **78** remains closed, but door **76** drops open, allowing the non-combustible material within the drum to fall into the discharge chamber. As the drum continues to revolve, bringing the dis-

charge chamber up to the position on the right-hand side of the drum shown in FIG 6, exit door **78** opens, allowing material contained within the discharge chamber to drop out by gravity. Further rotation of the drum causes the door **78** to close. Thus, for any position of rotation of the drum, at least one of the doors **76, 78** of each of the discharge chambers is closed, and the interior of the drum is thereby closed to the atmosphere.

The charred material continues to work its way toward the exit end of the drum, and passes through the screen **72**. As the charred material reaches the end of the drum, it is discharged through the arrangement shown in FIGS. 7 and 8.

Built out from the outer surface of the drum and extending continuously around the circumference thereof is a discharge chamber **84**. First and second discharge doors **86** and **88** are located on opposite sides of the drum from one another. The first door **86** is associated with an opening **91**, which opens from the interior of the drum into the discharge chamber **84**, while the second door **88** is associated with an opening **89**, which opens from the discharge chamber **84** into the atmosphere. Door **86** is hinged to the drum at **90** on the leading edge of the opening **91**, so that it falls open by gravity when at the bottom of the drum (as in FIG. 7), and closes by gravity when at the top of the drum (as in FIG. 8). Door **88** is hinged to the outside of the discharge chamber at **92** on the leading edge of opening **89**, so that it tends to fall open by gravity when at the bottom of the drum (as in FIG. 8), and tends to close by gravity when at the top of the drum (as in FIG. 7).

To keep the discharge door **88** from opening prematurely, means is provided for holding the door closed until it reaches a particular point in its rotational travel. Such means comprises a pair of arcuate cam shoes **94** and **95**, which surround the lower section of the discharge chamber **84**, as shown in FIGS. 7 and 8. The two cam shoes **94, 95** lie within a common vertical plane perpendicular to the axis of the drum, and their adjacent ends are spaced apart a short distance to form an opening **96**, which is offset slightly to one side of a vertical line passing through the said axis. The cam shoes are spaced radially outward a short distance from the outer surface of the drum, to provide clearance for the door **88** and its hinge **92** as the drum revolves. Each of the cam shoes has its leading and trailing ends turned outward slightly to form rounded edges which provide for smooth engagement and release of the door **88** and hinge **92** as they pass under the cams. Cam **94** holds door **88** closed until it reaches opening **96**, at which point the door is released and drops downwardly to discharge any material within chamber **84** through opening **91**. The material discharged through opening **91** drops through opening **96** into a suitable receptacle or conveyor (not shown), by which it is removed from the premises for disposal. The shorter cam shoe **95** engages and closes the door **88** as the drum continues to turn, and holds the door firmly shut until it reaches a point where gravity takes over and holds the door down against its seat.

The gases produced by the pyrolysis of the combustible material, and by the combustion process within the drum, are sucked out through an opening **96** in end plate **56** and through an exhaust duct and scrubber **98**, by a blower **100** driven by a motor **102**. From the blower, the gases are discharged through an exhaust duct **104** to a condenser (not shown), for further processing. The amount of suction created by the blower **100** is controlled by a slide valve **106**, which may be manually controlled or motorized. The exhaust duct and scrubber **98** has water spray nozzles **108** protruding through the walls thereof at angularly spaced and longitudinally spaced intervals, and these nozzles are connected to a water supply pipe **110**. Exhaust gases drawn off through duct **98** pass through a fine spray of water and are cooled thereby. At the same time, condensible tars entrained in the gas stream are condensed out, and these are recovered from the waste water.

The mode of operation of the invention is more or less as follows: Trash fed into the hopper **32** drops by gravity into the entrance end **14** of the drum, where it is advanced continuously to the pyrolyzing section **18** through the transfer compartment **48**, while doors **44** and **52** open and close in alternating sequence. At all times during the transfer operation, one or the other of doors **44, 52** is closed, so that there is no time during the rotation of the drum when both doors are open. The same is true of the discharge of non-combustible material through discharge chambers **74** and of char through discharge chamber **84**. In both cases, one of the exit doors is always closed when the other is open, so that at no time is the interior of the drum open to the atmosphere.

The blower **62** runs continually feeding air to the two burner nozzles **58**. Natural gas or other fuel is supplied to the burners **58** only during the preheat stage, when the drum and its contents are being brought up to an initial operating temperature of approximately 1200° F. The burners are thermostatically controlled to maintain the predetermined operating temperature. As the material heats up, gases are formed by the destructive distillation of the carbonaceous material in the drum, and eventually purge the system of all the initial atmosphere inside the drum. At this time, the fuel valve **68** is shut off, and air valve **70** is set to admit air in an amount sufficient to provide oxygen for the combustion of part of the combustible gases inside the drum. That portion of the combustible gas which is mixed with air ignites, and the flame will sustain itself as long as the necessary amount of oxygen is supplied. The air supply is controlled by valve **70**, and the latter is regulated by a temperature sensor (not shown), which increases or decreases the amount of air, as required, to hold the operating temperature to approximately 1400° F. It has been found by experience that only about 15% of the total gas generated by pyrolysis is needed to make up the heat losses of the system and to sustain pyrolysis. The excess gas, together with the combustion gases, are drawn off by the exhaust blower **100** to a condenser for further processing.

The apparatus shown and described herein is capable of accepting municipal or industrial trash, and without grinding or other preparation, of reducing the combustible portion thereof into charcoal and gas. The greatest portion of combustible components such as wood, and wood-derived by-products, including paper, cardboard, pressed wood, etc., is reduced to approximately 20% of its original mass. Plastics, paints, rubber, and other organic materials reduce to approximately 10% of their original mass. Non-combustible materials, such as metal parts, become stripped of their coatings of oil or paint, and become more valuable when sold for scrap metal. Other inert materials such as rocks and chunks of concrete help in the crushing and disintegration of the combustible material.

One advantageous feature of the invention is that the drum may be fabricated of steel and lined internally with refractories. The flame is entirely contained within the drum, and its heat impinges only on the refractory and the material being processed. The refractory becomes a heat barrier so that the steel shell may be maintained at a temperature below 1000° F., while allowing the internal temperature to rise as high as 3000° F., if necessary. This factor of increased operating temperature makes possible a material reduction in capital equipment costs, as trash can be processed from three to four times faster than in externally fired retorts. Moreover, transmission of heat from the flame to the material being processed is transferred through the gaseous atmosphere contained within the drum, as opposed to being transmitted by conduction through the walls of a steel drum.

While we have shown and described in considerable detail what we believe to be the preferred embodiment of the invention, it will be understood by those skilled in the

art that the invention is not limited to such details, but might take entirely different forms within the scope of the claims that follow.

What is claimed is:

1. An apparatus for decomposition of trash by heating the trash to become a charred residue of relatively reduced bulk utilizing combustible gas created by destructive distillation of carbonaceous material in the trash as a heating medium, the apparatus comprising:

a retort having an enclosed, hollow interior sealed from the atmosphere outside the retort and adapted to receive the trash and to contain the residue,

means for providing access to the interior of said retort to enable trash to be delivered thereto and the residue be removed therefrom,

means for sealing said access providing means for preventing communication through said means at any time between the interior of the retort and the atmosphere outside of said retort,

means for sensing the temperature inside the retort,

auxiliary means connected with the interior of said retort for raising the temperature therein to the level necessary for destructive distillation of the carbonaceous material during an initial start-up period of operation,

means for terminating operation of said auxiliary means when the temperature sensed by said temperature sensing means reaches the temperature necessary for destructive distillation of the carbonaceous material in the trash, thereby creating combustible gas,

means for admitting a controlled flow of non-combustible oxygen-containing gas to the interior of said retort in an amount sufficient to permit complete combustion of only a portion of said combustible gas as it is created by the destructive distillation of trash within said retort,

means connected with said admitting means for regulating the flow of non-combustible oxygen-containing gas in response to the temperature sensing means to maintain the temperature within the interior of said retort between a lower level necessary to maintain destructive distillation of trash and a predetermined upper level, the combustion of the portion of the combustible gas being sufficient to maintain the temperature of the interior of said retort above the level necessary for said destructive distillation without heat or fuel from any other source, said admitting means providing substantially the only inlet for oxygen-containing gas into the interior of the retort after terminating operation of the auxiliary heating means, and an outlet for escape of combusted and uncombusted gases from the interior of said retort.

2. An apparatus as defined in claim 1 wherein said auxiliary means for raising the temperature during start-up includes

a burner in communication with the interior of said retort and connected to an external supply of combustible fuel, said burner heating the interior of said retort until the temperature necessary for destructive distillation is reached.

3. An apparatus as defined in claim 1 in which said means for providing access to the interior of said retort includes

trash inlet means connected with said retort for admitting a flow of the trash to the interior of said retort and

residue outlet means connected with said retort for outflow of charred residue from the interior of said retort, and

said means for sealing the interior of said retort includes

inlet seal means enabling passage of trash through said trash inlet means without placing the interior in communication with the outside atmosphere and

outlet seal means enabling passage of residue through said residue outlet means without placing the interior in communication with the outside atmosphere.

4. An apparatus as defined in claim 1 wherein said retort is provided with a refractory lining about its inner surfaces defining the interior, said lining providing thermal insulation between the interior and the remainder of said retort.

5. An apparatus as defined in claim 4 wherein said retort comprises a cylindrical drum mounted for rotation about an approximately horizontal axis, said inlet and outlet means being connected with opposite axial ends of said drum, the apparatus further including

means for rotating said drum about the horizontal axis and

a spiral flight within said drum for moving the contents thereof toward said outlet means as said drum is rotated.

6. An apparatus as defined in claim 1 further including means connected with said outlet for condensing at least a portion of the gases leaving said outlet.

7. An apparatus as defined in claim 1 further including an exhaust blower connected with said outlet for drawing the combusted and uncombusted gases through said outlet from the interior of said retort.

8. An apparatus as defined in claim 3 wherein said retort extends longitudinally, with said outlet for gases being positioned at one longitudinal end of said retort, said burner being positioned internally of said retort adjacent the same longitudinal end thereof as said outlet for gases.

9. Apparatus for the pyrolytic decomposition of trash, comprising, in combination:

an elongated drum supported for rotation about an approximately horizontal axis, said drum having an entrance end, an exit end, and a mid-section between said ends;

means for driving said drum at a relatively slow rate of rotation;

loading means at the entrance of said drum for introducing trash into the interior of the drum while at all times excluding atmospheric air from entering that end of the drum through said loading means;

discharging means at the exit end of said drum for removing the residue of the trash from the interior of the drum while at all times excluding atmospheric air from entering that end of the drum through said discharging means;

at least one burner projecting into the interior of said drum at the exit end thereof, said burner being connected to a source of fuel;

means for supplying air to said burner to support combustion of said fuel, the interior of said drum being sealed against any substantial inflow of atmospheric air except that supplied to said burner;

valve means for admitting fuel to the burner during an initial start-up period for raising the temperature inside the drum to a predetermined level sufficient to cause destructive distillation of the carbonaceous material in the trash, with resultant production of combustible gas and for shutting off the source of fuel to said burner when the interior of said drum and its contents have reached the predetermined temperature and said interior has become filled with combustible gas produced by destructive distillation of the carbonaceous material in said trash;

means for regulating the supply of air to the interior of said drum to provide no more than enough oxygen to support combustion of the fuel during operation of the burner, whereby an oxygen-deficient atmosphere at elevated temperature is obtained in the interior of the drum, and to provide oxygen for the combustion of only part of the combustible gas generated by the decomposition of trash within said drum after said fuel supply to said burner has been shut off, so as to supply heat for sustaining the py-

rolytic decomposition of the trash without additional fuel; and

means for exhausting the combustion products resulting from the burning of said gas.

10. Apparatus as in claim **12**, wherein said loading means at the entrance end of said drum for introducing trash into the interior of the drum while providing a barrier between the interior and the atmosphere comprises:

first and second bulkheads disposed adjacent one another and spanning the entire interior of said drum, said bulkheads defining between them a closed transfer compartment;

each of said bulkheads having an opening therein closed by a door, said openings being spaced apart angularly from one another about the axis of rotation of the drum;

said doors being movably mounted with respect to the bulkhead related thereto to open in sequence when said drum is rotated so that trash loaded into said entrance end of the drum passes through the open door in said first bulkhead and into said transfer compartment while the door in said second bulkhead is closed, and then as the drum continues to revolve, said door and said first bulkhead closes and said door in said second bulkhead opens, allowing trash in said transfer compartment to pass through to said intermediate section of the drum where pyrolytic decomposition takes place.

11. Apparatus as defined in claim **10**, wherein said bulkheads are inclined in opposite directions to one another, said first bulkhead having its opening adjacent the edge nearest said entrance end of said drum, and said second bulkhead having its opening diametrically opposite from the opening in said first bulkhead;

each of said openings having a door hinged to the edge against the wall for drum, said doors being located on the side of the bulkhead facing towards said midsection;

each of said doors being operable to open by gravity when its hinged portion is at the bottom of the drum and to close by gravity when its hinged portion is at the top of the drum, whereby said doors open and close in alternate sequence as said drum revolves.

12. A method for decomposing trash by heating it to become a charred residue of relatively reduced bulk, utilizing combustible gas created by destructive distillation of carbonaceous material in the trash as a heating medium, the method comprising the steps of:

holding trash in the interior of a retort at a temperature sufficient to cause distillation of combustible gas from carbonaceous material in the trash while maintaining the interior of the retort closed against communication with atmospheric air;

burning the combustible gas within the interior of the retort to maintain the temperature at a level sufficient for continuing the destructive distillation of the carbonaceous material in the trash thereby creating additional combustible gas;

admitting a controlled flow of only non-combustible oxygen-containing gas to the interior of the retort to sustain combustion of only a portion of the combustible gas generated by the destructive distillation of the trash within the interior of the retort, the combustion of the portion of the combustible gas being sufficient to maintain the temperature of the interior of the retort above the level necessary for destructive distillation, and sensing the temperature within the interior of the retort,

regulating the flow of oxygen-containing gas admitted to the interior of the retort in response to the sensed temperature to control the temperature between a lower level necessary to sustain destructive distillation of the trash and a predetermined upper level, and

permitting outflow of combusted and uncombusted gases from the chamber.

13. A method as defined in claim **12** wherein there is an initial start-up period during which the temperature within the interior of the retort is raised from a lower temperature to the level necesary to cause destructive distillation of the carbonaceous material within the trash, the method including an initial step of:

burning an auxiliary fuel charge within the interior of the retort during the start-up period until the temperature is raised to the level necessary for destructive distillation.

14. A method as defined in claim **12** wherein there is an initial start-up period during which the temperature within the interior of the retort is raised from a lower temperature to the level necessary to cause destructive distillation of the carbonaceous material in the trash, the method including the steps of:

burning auxiliary fuel supplied from an external source to a burner positioned within the interior of the retort to raise the temperature of the interior of the retort; and

terminating the supply of auxiliary fuel to the burner when the sensed temperature in the interior of the retort reaches the level necessary for destructive distillation.

15. A method as defined in claim **12** including the initial step of protecting the retort against the high temperatures generated within its interior by lining inner surfaces of the retort defining the interior thereof with refractory material.

16. A method as defined in claim **12** wherein the retort is configured as a drum mounted for rotation about an approximately horizontal axis with trash entering the drum at one axial end of the drum and leaving as a charred residue at the other axial end, the method including the steps of:

rotating the drum about the horizontal axis and moving the trash within the drum towards the outlet end as the drum rotates.

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