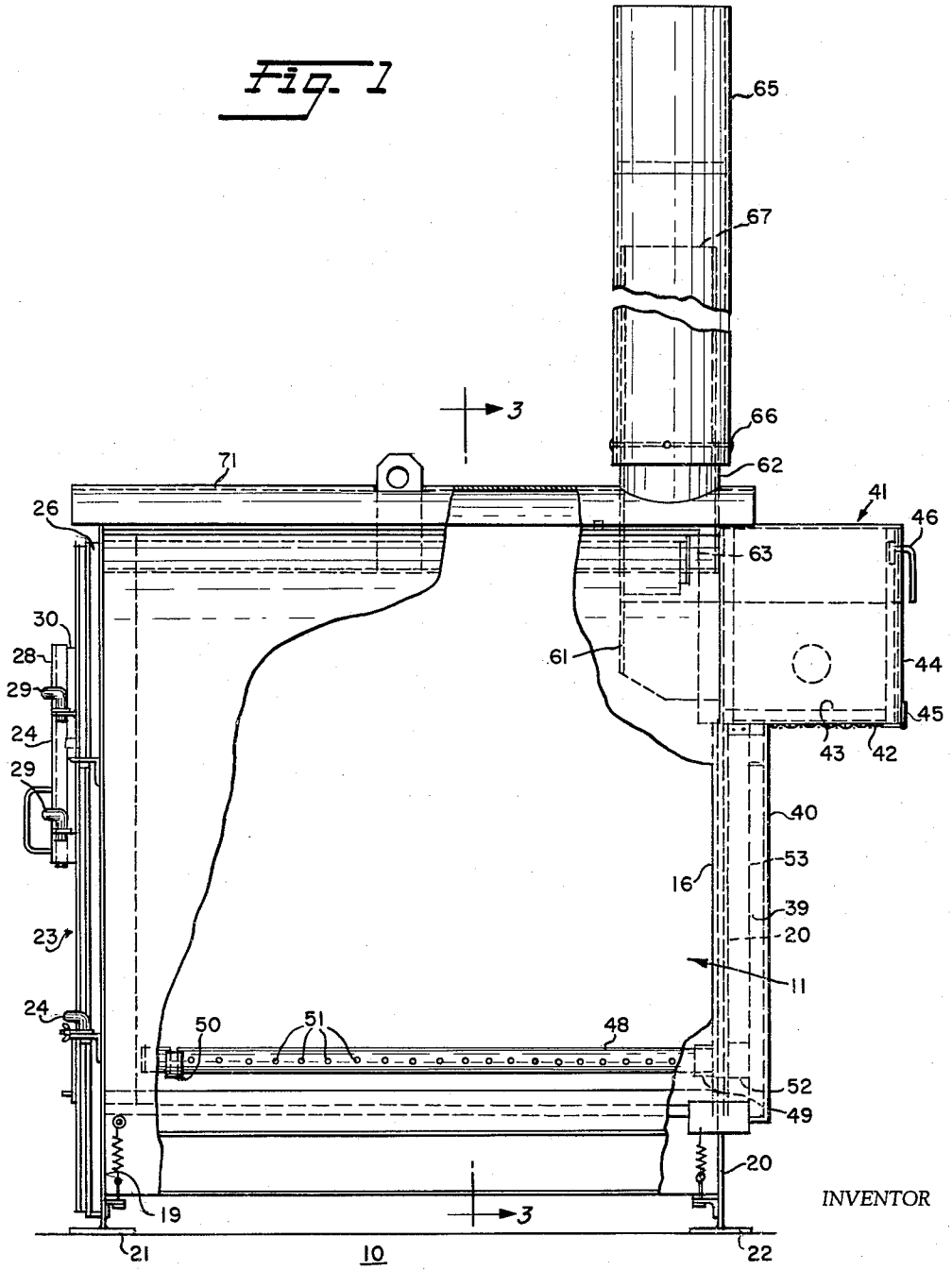
Nov. 2, 1965 G. H. HOSKINSON 3,215,101

BURNING APPARATUS

Filed Nov. 7, 1963 3 Sheets-Sheet 1

Fig. 1



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BURNING APPARATUS

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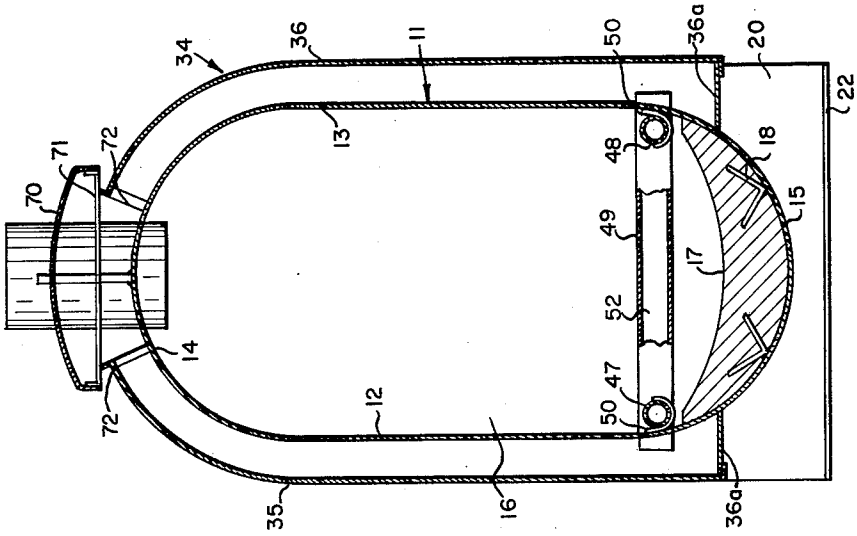


Fig. 3

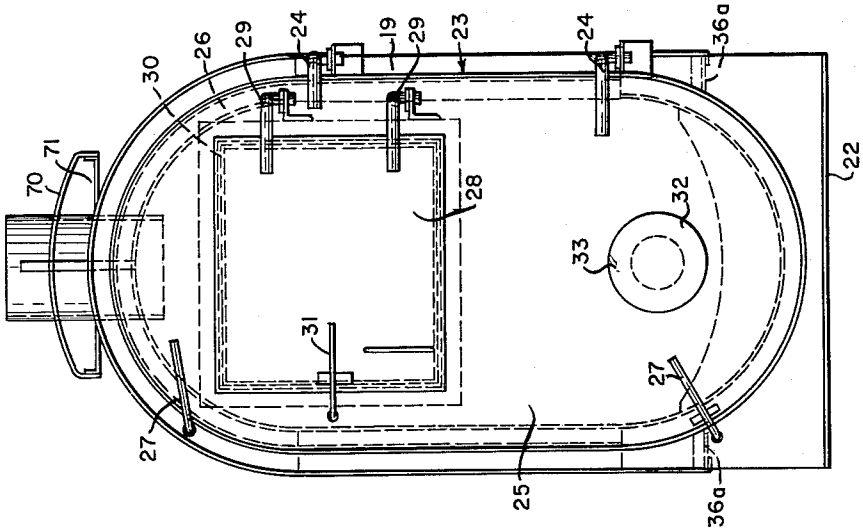


Fig. 2

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BURNING APPARATUS

Filed Nov. 7, 1963 3 Sheets-Sheet 3

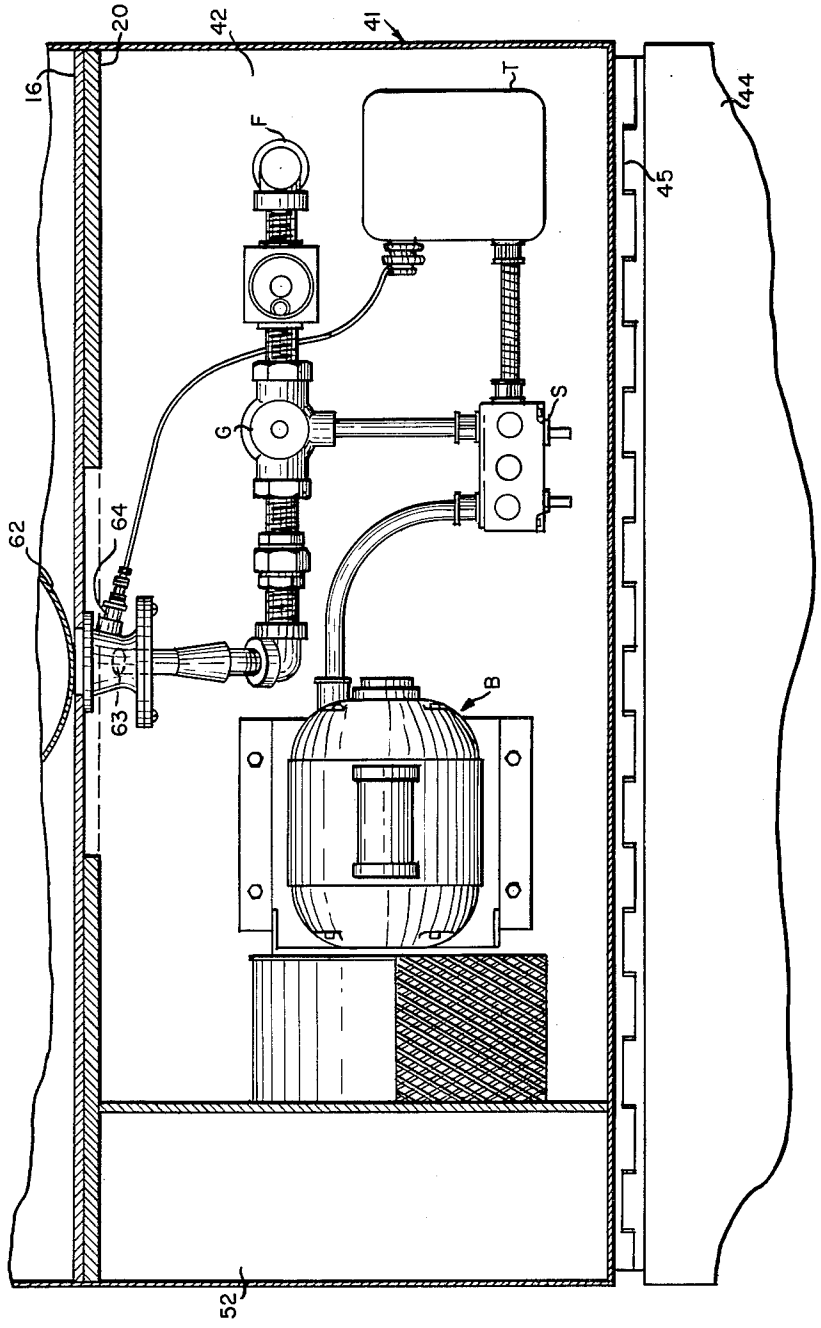


Fig. 4

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3,215,101

Patented Nov. 2, 1965

3,215,101

BURNING APPARATUS

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Filed Nov. 7, 1963, Ser. No. 322,578
14 Claims. (Cl. 110—8)

The present invention relates to burning apparatus, and more particularly, to burning apparatus of the class known as incinerator apparatus of a new and novel construction, and is capable of burning in large volume all types of rubbish, waste material and the like, regardless of their condition, in a more efficient manner than heretofore possible, and also makes possible the utilization of heat generated by the burner for other useful purposes.

Fire burning apparatus of the type designated as incinerators have been employed for a great many years as a means for disposing of trash, rubbish, waste material, and the like, but has possessed a great many disadvantages. For example, prior incinerator units emit a considerable amount of heavy smoke and other obnoxious waste products of combustion into the atmosphere which are quite hazardous to the health of the community in general. Moreover, such waste products of combustion also create an economical problem with respect to maintenance of property in general in the area where the material is burned due to the fact that such products of combustion not only soil virtually everything with which they come into contact, but also tend to enhance or hasten the deterioration of the physical property nearby.

The waste products of combustion generated during the burning of waste material are in the form of unburned carbon which gives rise to the heavy, dark smoke as well as gases and other obnoxious vapors which are generated during the burning operation. The large amount of carbon present in the waste products of combustion, and the generated gases, vapors, and the like is due to the incomplete or inefficient combustion during the actual burning of the materials. The failure to insure complete combustion of the carbon and like gases may be due to the design and structure of the incinerator itself, or may be the result of insufficient heat in the burning zone to effect an efficient operation, or an uncontrolled or improper amount of oxygen in the burning zone to effect the desired degree of combustion, or a combination of all three of the foregoing.

Another disadvantage possessed by prior incinerators and like apparatus is that such units capable of burning a large volume of waste material are extremely expensive in initial cost as well as upkeep, and yet are quite inefficient in operation. Moreover, prior incinerators capable of burning a large volume of waste material are so designed and operate in such a manner that excessive residue remains after burning and cannot be readily removed. This results oftentimes in a shut-down of the incinerator with a corresponding cooling thereof in order to permit a cleaning out of the unit before further burning can be effected.

Still another problem with prior incinerators is that the heat generated by the incinerator during the burning of the waste material is totally lost. There has been a long need in industrial plants, commercial establishments of all types, and the like for an incinerator which can be utilized to effect the burning of the desired waste material and yet also can utilize the heat generated for other purposes. Such prior incinerators, due to the inefficiency of operation and the waste products of combustion generated, have not been capable of being employed in such a manner.

Considerable time, effort, and money have been and are being expended in an effort to solve this problem.

Most solutions have been directed to redesigning the apparatus or providing auxiliary units which will permit a further burning of the waste products of combustion prior to passing the gases to the atmosphere. However, such secondary burning has not been completely successful since it has been found virtually impossible to remove all objectionable waste products of combustion prior to exhausting same with prior incinerator constructions. The reason for this is that the air present in or supplied to the incinerator during the initial burning of the waste material is in large amounts and functions as over-air burning of the trough or the like. As a result, the waste products of combustion are airborne and result in an excessive volume of waste products which are passed to the secondary burning zone or auxiliary unit for burning thereof. While considerable carbon may be burned in the auxiliary zone, it is impossible to effect a complete burning thereof due to the large volume of the waste products of combustion and spent air passing therethrough. As a result, while the smoke may be materially lessened in carbon content and therefore appear much lighter when exhausted, the presence of carbon is observable, as well as fly ash and other obnoxious and objectionable gases likewise being present. As a result, most communities have enacted stringent laws relative to the burning of rubbish, refuse, industrial waste and the like within the communities. Such laws and control have resulted in such material being transported to remote or isolated areas outside the communities to be burned. This practice obviously is costly and becomes burdensome financially to many small business men.

In the elimination of the foregoing and related disadvantages, it is therefore a principal object of the present invention to provide a burning unit for disposal of waste material of a new and novel structure possessing a more efficient operation than heretofore capable with prior apparatus.

Another object of the present invention is the provision of a burner unit for disposing of waste material that is extremely simple in design and construction, low in cost, and requires virtually no upkeep.

Still another object of the present invention is the provision of a burning apparatus that does not permit the emission of obnoxious waste products of combustion to the outside atmosphere during its operation, regardless of the material being burned.

Still another object of the present invention is the provision of a burning apparatus which will insure a substantially complete combustion of the objectionable waste products of combustion wherein the products emitted therefrom to the atmosphere will not be in a harmful or objectionable state.

Another object of the present invention is the provision of a burning unit wherein the waste products of combustion generated therein will be consumed prior to the emission of same to the outside atmosphere.

Still another object of the present invention is the provision of a burning unit for waste material which can function both as a heating unit as well as a trash or waste disposal unit.

A further object of the present invention is the provision of burning apparatus for waste material in which the heat generated therein may be utilized for other purposes.

Another object of the present invention is the provision of a burning unit that can be employed to burn a large volume of waste material in an efficient manner.

A further object of the present invention is the provision of burning apparatus for burning waste material in which the air present therein is in an amount far less than heretofore thought possible.

Yet another object of the present invention is the provision of burning apparatus in which the air employed therein is present in carefully controlled amounts.

Still another object of the present invention is the provision of burning apparatus in which the air is supplied therein in a new and novel manner.

Yet a further object of the present invention is the provision of burning apparatus in which there is no excessive air present to support and carry off the waste products of combustion in large volume.

A still further object of the present invention is the provision of burning apparatus in which the over-the-fire air system is not employed.

Another object of the present invention is the provision of burning apparatus that is capable of burning all forms of fire consumable waste material regardless of their state and without any pre-treatment thereof, such as drying.

A further object of the present invention is the provision of burning apparatus that effects a far greater consumption of waste material with virtually no residue remaining.

A still further object of the present invention is the provision of burning apparatus for burning waste material that may be employed in any area, neighborhood, or the like without objection thereto from the immediate residents.

Other and additional objects will become manifest from the ensuing description taken in conjunction with the accompanying drawings.

Broadly stated, the burner unit made in accordance with the present invention comprises an air-tight, fire resistant, metal casing, a door means secured to one end of said casing for access thereinto, an air inlet pipe mounted within said casing along each side edge thereof adjacent the floor thereof, each of said pipes having a plurality of horizontally spaced apertures for feeding air in the direction of the floor of said casing, means for passing air from the exterior of said casing into said air inlet pipes, and exhaust stack means secured to the top of said casing and extending upwardly therefrom in vertical relationship, said exhaust stack means including an inner stack member connected to said casing, fuel means secured to the lower end of said inner stack member, air inlet means secured to said inner stack member adjacent said fuel means, outer stack means connected to said inner stack member and circumferentially spaced therefrom forming a vertical passageway therebetween, the lower end of said outer stack member being open and spaced just above said casing to permit air to pass upwardly in the vertical passageway, the upper free end of said outer stack terminating substantially above the upper free end of said inner stack member.

To the accomplishment of the foregoing and related ends, the present invention then consists of the means hereinafter fully described and particularly pointed out in the claims, the annexed drawing and the following description setting forth in detail certain means in the carrying out of the invention, such disclosed means illustrating, however, but one of various ways in which the principle of the invention may be employed.

The present invention is illustrated, by way of example, in the accompanying drawings, in which:

FIGURE 1 is a side elevation partly in cross-section of a waste material burning apparatus made in accordance with the present invention.

FIG. 2 is a front elevation of the waste material burning apparatus shown in FIG. 1 with the outer exhaust stack removed.

FIG. 3 is a cross-sectional view taken on lines 3—3 of FIG. 1 with the outer stack removed.

FIG. 4 is an enlarged front elevation of the blower and control components employed in the operation of the material burning apparatus made in accordance with the present invention.

Reference is now to be had to the drawings, and with particular reference to FIGS. 1–3 wherein a waste material burning apparatus or unit generally designated by reference numeral **10** is shown. The burning unit **10**, as illustrated, comprises an inner casing, generally designated by reference numeral **11**, which is generally elongated along its major axis and oval in cross-section along its minor axis, as shown in FIG. 3. While this configuration of the inner casing **10** is particularly preferred from a standpoint of ease of operation and efficiency, it is to be understood that the inner casing can be of other configuration, such as, for example, rectilinear, and still perform satisfactorily.

The inner casing **11** includes side walls **12** and **13** joined to one another at their top ends by an integral curved top wall **14** and at their bottom ends by an integral curved bottom wall **15**. The inner casing **11** has a rear wall **16**, oval in configuration, secured by any suitable means, such as, for example, welding, bolting, or the like. Alternatively, the rear wall **16** may be integral with the side and top and bottom walls of the inner casing **11**, if desired. The advantage of having the rear wall **16** mounted in a non-integral state is that it will permit two or more casings to be assembled in end to end relationship to provide a burning unit of increased capacity, if so desired. Thus, such a construction makes it possible to satisfy a user's need, with only one basic inner unit of one size being manufactured regardless of the requested capacity. In any event, the rear wall **16** must be in completely air-tight relationship with the side, top, and bottom walls of the inner casing **1**.

The inner casing **11** may be made of any suitable metal that will withstand the high heat generated therein. For example, the inner casing **11** may be made of steel, steel alloys, heat resistant iron, and the like. A hearth **17** is provided for the inner casing **11** in the form of fire retardant or resistant material on the curved bottom wall **17**, as shown in FIG. 3. It is preferred, as illustrated, that the hearth **17** be a castable refractory material of high strength having its top surface concave in configuration. To provide anchoring means for the hearth **17**, when cast, angle plates **18** may be secured to the bottom wall **15** at suitable points by welding or the like. Suitable examples of refractory material capable of withstanding high, intense, and prolonged temperatures are fused silica, fire clay, fused alumina, fused refractory materials, kaolin refractory material, magnesite, mulite, refractory silicon, carbide, etc. While it is preferred that the hearth **17** be formed by casting in order to provide a smooth concave hearth surface, it is possible to form the hearth **17** by utilizing refractory material in brick or block form and still achieve a satisfactory hearth construction.

To provide the necessary supports for the inner casing **11** to raise same from the floor, ground, or the like, a front wall plate **19** and a rear wall plate **20** are secured to the respective ends of the inner casing **11**. The front and rear wall plates **19** and **20** are generally rectangular in configuration and are curved at the top with the outside dimension of each being greater than the outside dimension of the inner casing **11**. The front plate **19** has an oval corresponding with the oval configuration of the inner casing **11**, with the remainder thereof forming a framing plate. With regard to the rear wall plate **20**, if the rear wall **16** of the inner casing **11** is non-integral therewith, the rear wall **16** may be of a size corresponding to the front plate **19** such that there will be a perimetral flange portion extending around the rear of the inner casing **11**. The bottom free end of each of the wall plates **19** and **20** is provided with foot plates **21** and **22**, respectively, to insure proper support.

A door assembly, generally designated by reference numeral **23**, is hingedly secured by means of hinges **24** to one side of the front wall plate **19** and functions to

seal the inner casing 11 and render same completely air-tight. The door assembly 23 includes a main door 25 that is generally oval in configuration and is of a size greater than the oval configuration of the inner casing 11. An asbestos or similar refractory insulation sealing ring 26 is secured around the inside face of the perimetral edge of main door 25 and functions to insure an air-tight relationship between the inner casing and the door assembly. Locking latches 27 of any suitable design or construction are provided, as shown, to insure a tight locking of the door 23. The main door 25 is provided with a rectangular opening in the upper part thereof to provide means for feeding material to be burned without opening the main door. A feed door 28 is hingedly secured along one side by means of hinges 29 to the main door 25 and functions to seal the rectangular opening in the main door 25. The feed door 28 has a sealing insulating ring 30 on its inside face around its perimetral edge to aid in rendering the inner casing 11 air-tight. The feed door 28 is locked in sealed relationship. The lower portion of the main door 25 is provided with a small opening adjacent its lower opening to provide air draft means, if neeeded, in the initial start up of the burning unit 10. A cover 32 is mounted by means of a pivot pin 33 to the main door 25 and functions to cover and seal off the air draft opening during the normal operation of the burning unit 10.

To provide necessary protection against the heat generated in the inner casing 11 and transmitted to the walls thereof, a shield assembly, generally designated by reference numeral 34, surrounds the inner casing 11 in spaced relation therewith. The shield assembly 34 is open along its bottom edge and top edge to provide a vertical passageway on each side of the inner casing 11 to insure a continuous passage of cooling air therearound. The shield assembly 34 includes a pair of sheet metal members 35 and 36 which are positioned on each side of the inner casing 11 respectively in spaced relation, as shown in FIG. 3. The forward end of each sheet metal member 35 and 36 is secured to each side of the front wall member 19 respectively by any suitable means, such as, for example, riveting, screws, bolts, or the like. The bottom edge of each of the sheet metal members 35 and 36 is spaced above the bottom edge of the front wall member 19 to provide an adequate bottom opening for the air to pass upward. The top free edge of each of the sheet metal members 35 and 36 terminates at a point short of the top of front wall member 19, resulting in the top free ends thereof being arcuately spaced from one another forming a longitudinal passageway extending above the top of the inner casing 11. Each of the sheet metal members 35 and 36 extends rearwardly from each side edge of the front wall member 19, and is secured to the respective side edges of the rear wall plates 20 in the same manner as the front ends are to the front wall plate 19. If desired, bracing rods 36a may be secured between the sheet metal members 35 and 36 and the inner casing 11. Auxiliary sheet metal members 37 and 38 of a height less than the sheet metal members 35 and 36 are secured to the lower portion of each side edge of the rear wall member 20 and extend rearwardly therefrom for a distance substantially equal to the spacing between the inner casing 11 and the sheet metal members 35 and 36. A back sheet metal member 40 is secured along each side edge to the free end of each of the auxiliary sheet metal members 37 and 38 by riveting, screws, bolts, or the like, thereby forming a protective shield at the rear of the inner casing 11.

A control mounting casing, generally designated by reference numeral 41, is secured to the rear wall 20 immediately above the back sheet metal member 40 and extends rearwardly therefrom. The control mounting casing 41 includes a base frame 42 and an arcuate shield portion 43 conforming in configuration to the curvature of the side sheet metal members 35 and 36. A drop cover member 44 is secured along its bottom edge by means of hinges 45 to the free end of the base frame 42. The drop cover member 44 is provided with a handle and latch mechanism 46 to provide means for locking same to the arcuate shield portion 43. The controls positioned in casing 11 will be described more fully hereinafter.

To provide means for imparting air in a controlled and particular manner to the inner casing 11 to support combustion therein, a pair of air pipes 47 and 48 of a length substantially of the same length as the inner casing 11 are disposed therein. Each of the pipes 47 and 48 is disposed in horizontal relationship along the inner bottom edge of the side walls 12 and 13, respectively, just above the hearth 17. The forward ends of the pipes 47 and 48 are closed, with the opposite end of each of the pipes 47 and 48 being secured to a cross-header pipe 49 mounted in horizontal relationship along the inner face of the lower end of the rear wall 16. The air pipes 47 and 48 are held in place within the inner casing 11 by means of strap hanger 50. Each of the pipes 47 and 48 is provided with a plurality of small openings positioned along the length of each pipe in horizontally spaced relationship. The openings 50 are directed inwardly and downwardly to insure the direction of the air downwardly and inwardly toward the hearth 17. In this manner, during the burning of waste material therein the air supporting combustion will be provided only at the bottom or hearth area, with no over-the-fire air being provided.

To provide the necessary air, the header pipe 49 is connected in its medial area to one end of a pipe nipple 52 which extends outside of the inner casing 11. The other end of the pipe nipple 52 is connected to one end of a vertical duct or pipe 53 disposed along the outside face of the rear wall 16 or rear plate 20. The opposite end of the air duct or pipe 53 extends into the control mounting casing 41, where it is connected to a forced draft blower B mounted on the base frame 42. The blower B is generally of conventional design and requires no detailed description.

Referring now to FIG. 1, an illustrative embodiment of an exhaust stack assembly, generally designated by reference numeral 60, of the waste burning apparatus 10 is shown therein. The exhaust stack assembly 60 includes a first pipe segment or element made of fire resistant metal which is secured by welding or the like to the inner face of the back wall 16 of the inner casing 11 adjacent its top and in alignment with the control mounting casing 41. The first pipe segment 61 has its forward lower end cut away to provide an upwardly angled face to facilitate the upward draft movement of the waste products of combustion thereinto. Air in a quantity sufficient to induce a good draft and support the burning of the waste products of combustion may be supplied to the pipe segment 61 to be mixed with the waste products of combustion thereinto. The air may be passed thereinto through an air diffuser positioned in the pipe segment 61 from the air duct 53 or through another opening in the back wall 16 or back plate member 20.

Positioned above the pipe segment 61 in axial alignment therewith is an inner stack member 62 which extends through an opening in the top wall of the inner casing 11, and is secured by welding or the like thereto. The inner stack member 62 extends above the inner casing 11 in right angle relationship thereto for a height sufficient to permit the waste products of combustion to be passed therethrough and be burned therein in a manner to be more fully described hereinafter. A fuel nozzle 63 is mounted in the control mounting housing 41 and extends through an opening in the back wall member 16 and into an opening in the lower end of the inner stack member 62. The fuel nozzle 63 is positioned in an upwardly inclined relationship to insure an upward draft of the flame. The fuel nozzle 63 may be in the form an air-fuel assembly which will provide all of the air necessary

to support the burning of the waste products of combustion. Under such circumstances, therefore, it would be unnecessary to feed air into the pipe segment **61**. The fuel nozzle **63** is connected at its opposite end through piping to a fuel source (not shown) which may be either a gas fuel or liquid fuel. To effect the ignition of the fuel, a spark igniter **64** is connected at one end to a power source P and with the opposite end extends through the back wall member **16** with the fuel nozzle **63** and into the inner exhaust stack **62**.

The construction just described with respect to the lower end of the inner stack member **67** defines an initial or first burning zone for the waste products of combustion. This burning results in a material burning or otherwise partially converting the waste products of combustion generated by the burning of the waste material. However, such products of combustion still are not in a state that they can be passed to the atmosphere without creating problems. Thus, in order to accomplish this desired result of rendering the ultimate waste products of combustion into a suitable state in which they can be expended into the outside atmosphere, a second burning zone will be necessary to effect a further burning of the waste products of combustion before such products can be passed to the atmosphere.

To provide the second burning zone, an outer stack member **65** is secured to the inner stack **62** above the first burning zone therein and extends upwardly therefrom in spaced enveloping relationship wtih respect to the inner stack member **62**. The outer stack member **65** may be made of the same metal as the inner stack **62** and is secured thereto in spaced relationship by means of connecting rods **66** extending therethrough at various convenient points. The outer stack member **65** extends upwardly and beyond the upper outlet or free end **67** of the inner stack member **62** and constitutes a final exit stack for the ultimate waste products of combustion. The outer stack member **65** is spaced circumferentially from the inner stack member **62** for a distance sufficient to provide a circumferential air channel or passageway therebetween in which fresh air will rise vertically. Thus, the formed air channel therebetween will provide the air at the terminal or exit end **67** of the inner stack member **62**, with this zone just above the terminal end constituting the second burning zone to effect the final burning of the waste products of combustion such that they can be emitted to the atmosphere in completely safe and substantially clean state.

In order to provide a suitable second burning zone, the inner stack member **62** must be of a sufficient height such that the air passageway formed between the inner stack member **62** and the outer stack member **65** will be sufficiently long to effect a proper heat transfer between the heat generated by the burning of the products of combustion in the first burning zone in the inner stack member **62** in order to heat the air passing upwardly therearound to such a temperature that self-ignition will be possible between the waste products of combustion passing from the exit end **67** of the inner stack member **62** and the incoming air converging therewith at the exit end thereof. Thus, the outer stack member **65** must not be spaced from the inner stack member **62** at too great a distance such that the volume of air passing upwardly therebetween in the formed air passage will be too large in volume to be heated. The spacing should be sufficient to permit a volume of air therein sufficient to support the further burning of the waste products of combustion, but will be of a volume insufficient to receive the heat transferred from the inner stack member **62** such that the air will not be heated to the required temperature. From the foregoing, it is believed obvious that the inner stack member **62** must be of a length and diameter and the outer stack member **65** must be so spaced with respect thereto that the heat transfer between the inner stack member **62** and the volume of air passing upwardly therebetween will be effected such that when the air passes above the terminal or exit end **67** of the inner stack member **62**, the air will admix with the waste products of combustion and will be at a temperature such that the admixture will immediately ignite thereby effecting the desired further burning of the waste products of combustion. In the general operation of the stack unit just described, the effect of the further burning or conversion of the waste products of combustion in the second burning zone results in the final products of combustion being placed in a condition such that they can be passed to the atmosphere in a completely safe and unobjectionable state.

Referring now to FIG. 4, the control housing member **41** is shown therein to illustrate the controls to be employed in the present invention. As illustrated, the blower B is connected to one side of a double switch S, the switch S being, in turn, connected to a transformer T connected to a power source (not shown). The other side of the double switch S is connected to a gas control solenoid G of fuel line F and functions to feed the gas into the inner stack member **62**. The spark igniter **64** is connected through a line to the transformer T. If desired, the electrical circuitry may be provided with timer mechanism to automatically shut off some or all of the control mechanism.

In the operation of the burning apparatus **10**, the inner casing **11** is loaded with waste material to be burned. This material may be dry, moist, or wet, and can be burned efficiently in the apparatus **10** without means of fuel added thereinto. The waste material is ignited and the inner casing **11** made airtight and air is fed thereinto in a controlled amount through the orifice **51** of the pipes **50** in a downward and inward direction toward the hearth **17**. This results in the burning of the trash in the immediate vicinity of the hearth **17**, and thus the burning is upwardly from the bottom with no over-the-fire air being supplied. The burning of the trash in this manner results in the hearth **17** becoming quite hot and remaining in this state throughout any burning. Thus a large amount of air is not necessary to support the burning of the trash and the like. Moreover, burning in this manner will result in heat and waste products of combustion passing upwardly through the waste material mass to effectively dry same into a readily combustible state.

The amount of air to be fed into the inner casing **11** through pipes **47** and **48** should be just sufficient to support the burning in a non-over-the-fire relationship. Thus the waste products of combusion generated in the inner casing **11** will be the only material to be exhausted rather than waste products of combustion dispersed with a large volume of spent air, as is the case with most incinerators. Therefore, this operation in and of itself tends to lessen the amount of waste products that would normally be expended into the atmosphere.

As the waste products of combustion generated in the inner casing **11** pass upwardly, the fuel nozzle **63** is turned on with an amount of fresh air being present just sufficient to effect the burning of the waste products in the first burning zone in the lower end of the inner stack member **62**. The remaining portion of the waste products of combustion in a very hot state passes upwardly in the inner stack member **62** and heats same to a high degree. Fresh air enters at the bottom end of the outer stack member **65** and is drawn upwardly in the circumferential passageway formed by the spacing of the outer stack member **65** from the inner stack member **62**. As the air passes upwardly, it is heated by heat exchange relationship with the inner stack member **62** to a high level until it merges with the waste products of combustion exiting from the terminal end **67** of the inner stack member **62**. Upon the mixing of the heated fresh air with the remaining waste products of combustion in the outer stack member **65** above the exit end **67** of the inner stack member **62**, a self-ignition of the mixture occurs. This results in the formation of a second burning zone in which a complete burning of the remain-

ing waste products of combustion occurs therein. The resulting gases, which are now free of carbon and other obnoxious products passes to the atmosphere out through the terminal upper end of the outer stack member 65.

As hereinbefore indicated, the sheet metal members 35 and 36 of the shield assembly 34 terminate at their upper end in spaced relation, forming a longitudinal passageway. As illustrated, the formed passageway is shielded by a top shield member 70 secured at its respective longitudinal edges to cross-pieces 71, which are connected to bracing rods 72 mounted on the inner casing 11. However, the formed passageway may be utilized to receive a heat exchange therein through which waste products of combustion may be passed to heat fresh air blow therethrough. The heated air can then be utilized to heat any desired area. Such a heat exchange assembly and its operation is disclosed in my United States Patent No. 3,044,460.

While there have been described herein what are at present considered preferred embodiments of the invention, it will be obvious to those skilled in the art that modifications and changes may be made therein without departing from the essence of the invention. It is therefore to be understood that the exemplary embodiments are illustrative and not restrictive of the invention, the scope of which is defined in the appended claims, and that all modifications that come within the meaning and range of equivalency of the claims are intended to be included therein.

I claim:

1. A burning unit for disposing waste material comprising an elongated air-tight casing member defining the combustion zone of said burning unit, pipe means mounted inside of said casing member along each side adjacent the lower end thereof and extending substantially the axial length thereof, said pipe means having a plurality of horizontally spaced apertures for directing air downwardly and inwardly toward the bottom of said casing member, means for supplying exterior air to said interiorly positioned pipe means and exhaust stack means secured to the top of said casing member for carrying off the waste products of combustion, said exhaust stack means including means for effecting the sequential burning of the waste products of combustion in two vertically spaced burning zones within said stack means.

2. A burning unit for disposing waste material comprising an elongated air-tight casing member defining the combustion zone of said burning unit, door means secured to one end of said casing member for access thereinto, shield means mounted in spaced relation around said casing member, pipe means mounted inside of said casing member along each side adjacent the lower end thereof and extending substantially the axial length thereof, said pipe means having a plurality of horizontally spaced apertures for directing air downwardly and inwardly toward the bottom of said casing member, means for supplying exterior air to said interiorly positioned pipe means and exhaust stack means secured to the top of said casing member for carrying off the waste products of combustion, said exhaust stack means including means for effecting the sequential burning of the waste products of combustion in two vertically spaced burning zones within said stack means.

3. A burning unit for disposing waste material comprising an elongated air-tight casing member defining the combustion zone of said burning unit, hearth means secured to the bottom of said casing member, door means secured to one end of said casing member for access thereinto, shield means mounted in spaced relation around said casing member, pipe means mounted inside of said casing member in close proximity to said hearth means and along each side adjacent the lower end thereof and extending substantially the axial length of said casing member and said hearth means, said pipe means having a plurality of horizontally spaced apertures for directing air downwardly and inwardly toward the bottom of said casing member, means for supplying exterior air to said interiorly positioned pipe means, and exhaust stack means secured to the top of said casing member for carrying off the waste products of combustion, said exhaust stack means including means for effecting the sequential burning of the waste products of combustion in two vertically spaced burning zones within said stack means.

4. A burning unit for disposing waste material comprising an elongated, air-tight casing member defining the combustion zone of said burning unit, hearth means secured to the bottom of said casing member, door means secured to one end of said casing member for providing access thereinto, shield means mounted in spaced relation around said casing member, pipe means mounted inside of said casing member in close proximity to said hearth means and along each side adjacent the lower end thereof and extending substantially the axial length of said casing member and said hearth means, said pipe means having a plurality of horizontally spaced apertures for directing air downwardly and inwardly in the direction of said hearth means, means for supplying exterior air to said interiorly positioned air supply means, and exhaust stack means secured to said casing member at the top thereof and extending upwardly in a vertical direction for carrying off the waste products of combustion, said exhaust stack means including an inner stack member secured at one end to said casing member and an outer stack member having its bottom free end positioned upwardly and free from said casing member and being secured in circumferentially spaced relation to said inner stack member thereby defining a vertical air passage therebetween, fuel means and air means adjacent the lower end of said inner means to ignite the waste products of combustion in the lower end of said inner stack member and to constitute a first burning zone and the waste products of combustion existing from said inner stack member mixing with heated air rising in the formed vertical air passage being burned thereabove in the outer stack member to constitute the second burning zone.

5. A burning unit for disposing waste material comprising an elongated, air-tight casing member defining the combustion zone of said burning unit, hearth means positioned on the bottom of said casing member, door means secured to one end of said casing member for access thereinto, shield means mounted in spaced relation around said casing member, an air pipe secured interiorly along each side wall of said casing member in a horizontal plane adjacent the bottom edge thereof and just above the hearth means and extending substantially the axial length of the casing member and the hearth means, each of said pipes having horizontally spaced apertures therein for directing air downwardly and inwardly in the direction of said hearth, the end of each of said pipes remote from the door being connected to a header pipe mounted on the back wall of said casing member, air inlet means secured to said header for passing air from the exterior thereinto and exhaust stack means secured to the top of said casing member, said exhaust stack means including means for effecting the sequential burning of the waste products of combustion in two vertically spaced burning zones within said stack means.

6. A burning unit for disposing waste material comprising an elongated air-tight casing member defining the combustion zone of said burning unit, hearth means positioned on the bottom of said casing member, door means secured to one end of said casing member for access thereinto, shield means mounted in spaced relation around said casing member, an air pipe secured interiorly along each side wall of said casing member in a horizontal plane adjacent the bottom edge thereof and just above the hearth means and extending substantially the axial length of said casing member and said hearth means, each of said pipes having horizontally spaced apertures therein for directing air downwardly and inwardly in the direction of said hearth, the end of each of said pipes remote from the door means being connected to a header pipe mounted on the

back wall of said casing member, air inet means secured to said header for passing air from the exterior thereinto and exhaust stack means secured to the top of said casing member, an inner stack member secured at one end to said casing member and an outer stack member having its bottom free end spaced upwardly from and free from engagement with said casing member and being secured in circumferentially spaced relation to said inner stack member thereby defining a vertical air passage therebetween, fuel means and air means adjacent the lower end of said inner stack means to ignite the waste products of combustion in the lower end of said inner stack member and to constitute a first burning zone and the waste products of combustion exiting from said inner stack member mixing with heated air rising in the formed vertical air passage being burned thereabove in the outer stack member to constitute the second burning zone.

7. A burning unit for disposing waste material comprising an elongated, air-tight casing member defining the combustion zone of said burning unit, hearth means secured to the bottom of said casing member, door means secured to one end of said casing member for providing access thereinto, shield means mounted in spaced relation around said casing member, pipe means mounted inside of said casing member in close proximity to said hearth means and along each side thereof and extending substantially along the axial length of the casing member and the hearth means, said pipe means having a plurality of horizontally spaced apertures for directing air downwardly and inwardly in the direction of said hearth means, means for supplying exterior air to said interiorly positioned air supply means, and exhaust stack means secured to said casing member at the top thereof and extending upwardly in a verticaly direction for carrying off the waste products of combustion, said exhaust stack means including an inner stack member extending down into the casing member and being secured thereto in vertical relation, an outer stack member positioned above and free from engagement with the casing member and being in circumferentially spaced enveloping relationship with the portion of said inner stack member extending above the casing member, said outer stack member being of a length greater than said inner stack member, fuel means and air means adjacent the lower end of said inner stack means to ignite the waste products of combustion in the lower end of said inner stack member to constitute a first burning zone, and the waste products of combustion exiting from said inner stack member mixing with heated air rising in the formed passageway being burned thereabove in the outer stack member to constitute the second burning zone.

8. A burning unit for disposing waste material comprising an elongated, air-tight casing member defining the combustion zone of said burning unit, hearth means positioned on the bottom of said casing member, door means secured to one end of said casing member for access thereinto, shield means mounted in spaced relation around said casing member, an air pipe secured interiorly along each side wall of said casing member in a horizontal plane adjacent the bottom edge thereof and just above the hearth means and extending substantially the axial length of the casing member and the hearth means, each of said pipes having horizontally spaced apertures therein for directing air downwardly and inwardly in the direction of said hearth, the end of each of said pipes remote from the door being connected to a header pipe mounted on the back wall of said casing member, air inlet means secured to said header for passing air from the exterior thereinto and exhaust stack means secured to the top of said casing member, an inner stack member extending down into the casing member and being secured thereto in vertical relation, an outer stack member positioned above and free from engagement with the casing member and in circumferentially spaced enveloping relationship with the portion of said inner stack member extending above the casing member, said outer stack member being of a length greater than said inner stack member, fuel means and air means adjacent the lower end of said inner stack means to ignite the waste products of combustion in the lower end of said inner stack members to constitute a first burning zone, and the waste products of combustion exiting from said inner stack member mixing with heated air rising in the formed passageway being burned thereabove in the outer stack member to constitute the second burning zone.

9. A burning unit for disposing waste material comprising an elongated air-tight casing member defining the combustion zone of said burning unit, pipe means mounted inside of said casing member along each side adjacent the lower end thereof and extending substantially the axial length thereof, said pipe means having a plurality of horizontally spaced apertures for directing air downwardly and inwardly toward the bottom of said casing member, said air constituting the sole air for supporting the burning of the waste material with no over-the-fire air being present, means for supplying exterior air to said interiorly positioned pipe means, and exhuast stack means secured to the top of said casing member for carrying off the waste products of combustion, said exhaust stack means including means for effecting the sequential burning of the waste products of combustion in two vertically spaced burning zones within said stack means.

10. A burning unit for disposing waste material comprising an elongated air-tight casing member defining the combustion zone of said burning unit, pipe means mounted inside of said casing member along each side adjacent the lower end thereof and extending substantially the axial length thereof, said pipe means having a plurality of horizontally spaced apertures for directing air downwardly and inwardly toward the bottom of said casing member, means for supplying exterior air to said interiorly positioned pipe means, and exhaust stack means secured to the top of said casing member for carrying off the waste products of combustion, an inner stack member secured at one end of said casing member and an outer stack member having its bottom free end spaced upwardly from and free from engagement with said casing member and being secured in circumferentially spaced relation to said inner stack member thereby defining a vertical air passage therebetween, fuel means and air means adjacent the lower end of said inner stack means to ignite the waste products of combustion in the lower end of said inner stack member and to constitute a first burning zone, and the waste products of combustion exiting from said inner stack member mixing with heated air rising in the formed passageway being burned thereabove in the outer stack member to constitute the second burning zone.

11. A burning unit for disposing waste material comprising an elongated air-tight casing member defining the combustion zone of said burning unit, pipe means mounted inside of said casing member along each side adjacent the lower end thereof and extending substantially the axial length thereof, said pipe means having a plurality of horizontally spaced apertures for directing air downwardly and inwardly toward the bottom of said casing member, means for supplying exterior air to interiorly positioned said pipe means and exhaust stack means secured to the top of said casing member for carrying off the waste products of combustion, an inner stack member extending down into the casing member and being secured thereto in vertical relation, an outer stack member positioned above and free from engagement with the casing member and in circumferentially spaced enveloping relationship with the portion of said inner stack member extending above the casing member, said outer stack member being of a length greater than said inner stack member, fuel means and air means adjacent the lower end of said inner stack means to ignite the waste products of combustion in the lower end of said inner stack member to constitute a first burning zone, and the waste products of combustion exiting from said inner stack member mixing with heated air rising in the formed passageway being burned there-

above in the outer stack member to constitute the second burning zone.

12. A burning unit for disposing waste material comprising an elongated, air-tight casing member defining the combustion zone of said burning unit, hearth means positioned on the bottom of said casing member, door means secured to one end of said casing member for access thereinto, shield means mounted in spaced relation around said casing member, an air pipe secured along each side wall of said casing member in a horizontal plane adjacent the bottom edge thereof and just above the hearth means and extending substantially the axial length of said casing member and said hearth means, each of said pipes having horizontally spaced apertures therein for directing air downwardly and inwardly in the direction of said hearth, the end of each of said pipes remote from the door means being connected to a header pipe mounted on the back wall of said casing member, air passage means mounted on the outside face of said inner casing member in vertical relationship and being operatively connected at its lower end to said header means, blower means secured to the other end of said air passage means for imparting air thereinto, and exhaust stack means secured to the top of said casing member, said exhaust stack means including means for effecting the sequential burning of the waste products of combustion in two vertically spaced burning zones within said stack means.

13. A burner unit in accordance with claim 6, wherein pipe means are secured to the inside face of the rear wall of said casing member and just below and in vertical alignment with said inner stack member, said pipe means having air supply means for mixing air with the waste products of combustion.

14. A burner unit in accordance with claim 7, wherein pipe means are secured to the inside face of the rear wall of said casing member and just below and in vertical alignment with said inner stack member, said pipe means having air supply means for mixing air with the waste products of combustion.

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