

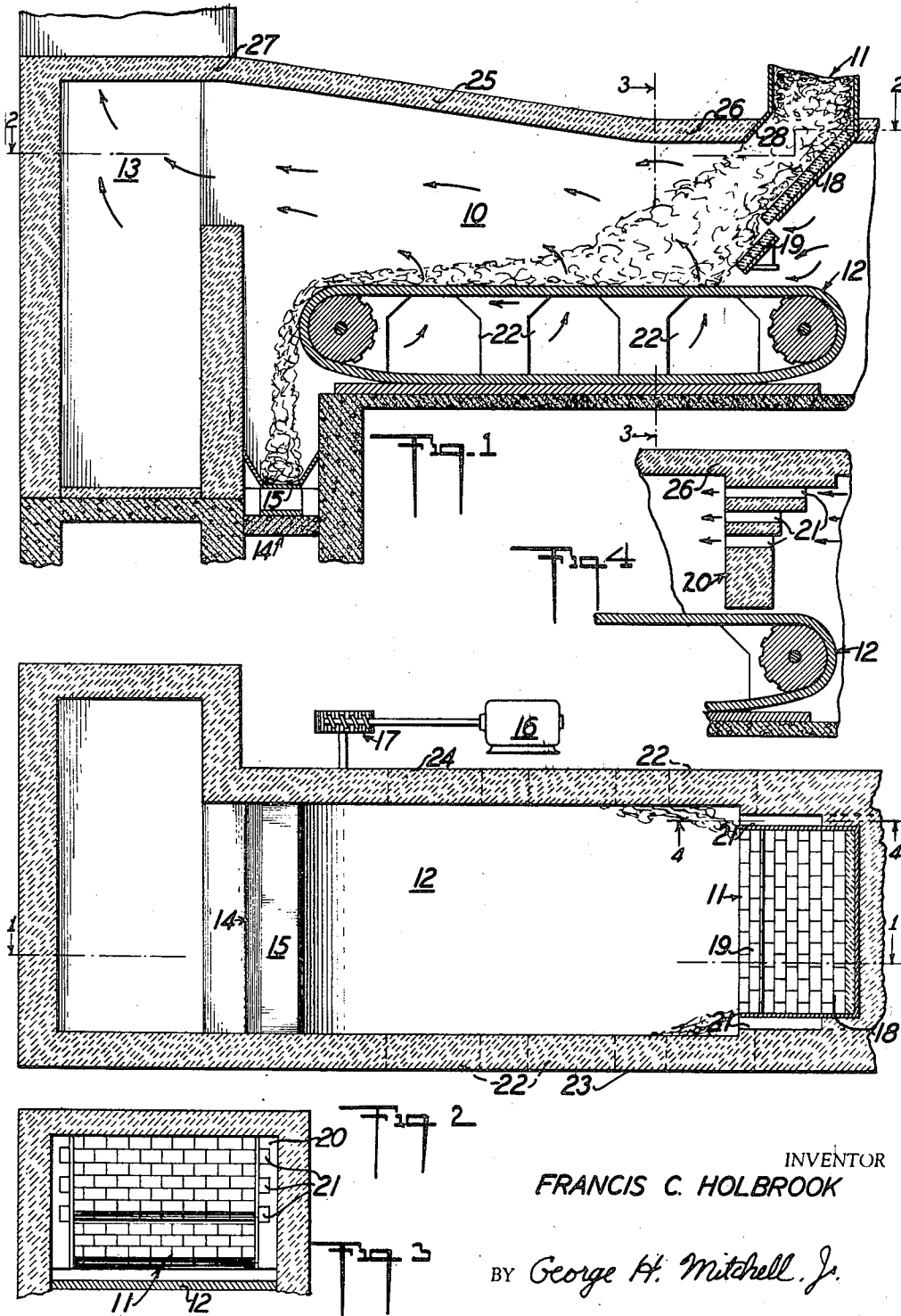
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REFUSE DESTRUCTOR

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REFUSE DESTRUCTOR

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6 Claims. (Cl. 110—15)

This invention relates to refuse destructors, and more particularly to apparatus used in the incineration of the usual forms of refuse found in present day urban communities.

Many attempts have been made to provide furnaces for the purpose of continuously burning refuse, but these attempts have resulted in structures which are cumbersome and inefficient, or require careful control of their operation in order to produce satisfactory results. In most cases, the incinerating furnaces now in use require that the refuse undergo some preliminary treatment or classification before being charged.

Therefore, it is an object of this invention to provide a destructor furnace which will burn raw refuse as it is received continuously, reducing it to volatile products of combustion with a minimum of solid residues.

It is a further object of this invention to provide a refuse destructor furnace which is compact, simple in operation, and capable of causing refuse to be continuously burned by self-ignition.

It is another object of this invention to provide a refuse incinerator having a chamber through which refuse may be moved continuously while in the process of destruction by burning, which chamber permits complete combustion of the refuse.

Still another object of the invention is to provide a refuse incinerator having means to allow combustion air to become thoroughly intermixed with the refuse so as to induce complete reduction of the refuse to volatile products and solid residues.

Briefly stated, the present apparatus comprises a furnace, or ignition, chamber, in which there is disposed a horizontal travelling chain grate. At one end of the chamber a hopper is provided which continuously feeds refuse to one end of the chain grate. The bottom of the hopper is constructed so that as the refuse is fed to the grate it receives a tumbling action which tends to stir up the mass and expose the individual pieces to the action of air which is introduced through openings provided in the hopper and adjacent to the sides. Air is also introduced to the underside of the refuse as it moves along on the grate. The upper surface of the chamber forms a heat-reflecting arch extending over substantially the entire length of the grate and flaring upwardly in the direction of the discharge end of the grate, at which end the products of combustion are released to the stack and the solid residues drop down to a disposal pit containing a conventional water seal conveyor leading out of the furnace. The operation of the furnace is continuous, and the process of combustion is self-sustaining.

Other objects of the invention will be apparent to those skilled in the art after reading the following specification and accompanying drawing, in which:

Fig. 1 is a cross-sectional elevation of the furnace taken on the line 1—1 of Fig. 2; Fig. 2 is a horizontal cross-section taken on the line 2—2 of Fig. 1; Fig. 3 is a vertical cross-section taken on the line 3—3 of Fig. 1;

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Fig. 4 is a fragmentary cross-sectional elevation taken on the line 4—4 of Fig. 2.

In the drawing, the furnace chamber is indicated generally at 10, and is provided at one end with an opening through which a hopper, indicated generally at 11, may feed refuse to a travelling chain grate 12. The products of combustion in the furnace are released through the outlet 13 leading to the stack, while solid residues drop from the discharge end of the grate into a pit 14 which may be provided with a conventional water seal conveyor 15 for removing the residues from the pit. The grate 12 may be of any conventional design which will provide support for a moving bed of refuse being consumed in the furnace, and is driven by a motor 16 through gearing 17.

Referring to Fig. 1 it will be observed that the bottom of hopper 11 is divided into a plurality of sections 18 and 19 which are divided transversely with respect to the flow of refuse, section 19 being downwardly offset and spaced from section 18, while the lower edge of section 19 is spaced from the top of the moving grate 12. By referring to Fig. 2 it may also be seen that the lower edge of section 19 is somewhat narrower than the grate 12. The effect of offsetting the sections 18 and 19 is to cause the refuse to be tumbled and agitated so that individual pieces are loosened and "fluffed up." This "fluffing up" is further aided by the spreading out of the refuse on the chain grate as it leaves the bottom of the hopper.

The space between the upper edge of section 19 and the lower edge of section 18 is preferably left open to the outside atmosphere, and the air admitted through this space reaches the interior of the refuse and becomes intermingled with it during the course of the "fluffing up" operation, materially increasing the process of combustion. Further to assist in this process, the end wall 20 of the chamber 10 is provided with a series of ports 21 placed adjacent the sides of hopper 11 to permit the introduction of air into the chamber to the upper surface of the burning refuse. Air is also admitted through ports 22, provided in the side walls 23 and 24 below the upper flight of chain grate 12. The air supplied to ports 22 may be furnished under pressure by a suitable blower system, but it has been determined by actual experiment that forced draft is unnecessary, and may even be undesirable because of a tendency to produce smoke. However, the grate 12 should be designed so that sufficient air space is provided between individual supporting elements to allow admission of air to the underside of the burning refuse.

The upper wall, or arch, 25 of the furnace chamber is made of suitable refractory material. It may be flat over its entire surface or be provided with a slight transverse curvature. At the charging end of the furnace the rear end 26 of the arch meets the upper wall 23 of the feeding hopper, while the forward end 27 of the arch is spaced from the grate 12, and the refuse upon it, to allow for the expansion of gases in the chamber as they proceed in the direction of the outlet 13. Due to the upward flare of the arch 25, the cross-sectional area of the furnace chamber increases in the direction of the outlet for volatile products of combustion. At the same time the arch is sufficiently close to the burning refuse during its travel through the furnace that the heat reflected by it will support auto-combustion.

In operation, the hopper of a refuse destructor of this type was loaded with refuse as it was received at the plant. This refuse consisted of large cartons, small pieces of furniture, automobile tires, tin cans, metal drums, ashes, and a large percentage of garbage. Combustion was initiated by application of a match to a small piece of combustible material, such as a carton. The combustion thus begun

was self-sustaining, and additional refuse was continuously fed to the hopper as fast as the travelling grate moved the materials through the furnace. The solid residues removed from the pit 14 were free of clinker and resembled a light and fluffy ash containing a large percentage of metals and other inc combustibles. While it has been demonstrated that raw refuse may be burned in this incinerator under the conditions just described, it has been found that more uniform results are obtained when "hogged" refuse is charged. The "hogging" may be done by passing the raw refuse through a suitable hammer mill which reduces the material to pieces having sizes within the range of 3 to 5 inches. In one test of burning "hogged" refuse approximately 40 yards (8 tons) of material was stock piled over a period of five days, during which time a quantity of water was applied to increase the moisture content of the mixture. When this material was fed to the hopper continuously under conditions previously described combustion proceeded without the use of auxiliary firing devices, with the production of similar residues. In all tests conducted there was no heavy slag adhesion to the furnace walls or arch and the residues were practically free of burnable matter and clinker.

In certain cases it may be desirable to use batch feeding, and it has been found that satisfactory results may thus be obtained. As with continuous feeding, combustion is self-sustained, and the residues are free from burnable materials and clinker. However, continuous feeding is preferable, and a greater volume of material can be handled in this way.

While the incinerator has been shown in connection with a chain grate, it will be understood that any suitable form of travelling grate may be used which will enable the refuse to form a moving bed in the furnace chamber. It will also be understood that changes may be made in the feeding apparatus which will induce "fluffing up" of the refuse. The term "fluffing up" as used in the claim is intended to cover any action which causes tumbling, agitating, shaking stirring, or equivalent rearrangement of the refuse to enable more intimate intermixture of combustion air and refuse.

I claim:

1. In an incinerator for continuous burning of raw refuse, a horizontally disposed furnace chamber having a single feeding means at one end to introduce all material including said raw refuse to be burned and outlet means for all of the volatile products of combustion at the other end, means in the chamber to move refuse continuously away from the feeding means toward said outlet means in one direction concurrent with the flow of gases, said chamber having a substantially flat heat-reflecting arch above said refuse moving means inclined angularly upwardly in the direction of movement of the refuse to radiate heat to dry and to support self-combustion of said refuse, said furnace chamber being provided with inlet ports disposed at the sides and bottom of said refuse feeding means to introduce air into the interior of the refuse being fed.

2. In an incinerator for continuous burning of raw refuse, a horizontally disposed furnace chamber having refuse feeding means to continuously introduce together all material including said raw refuse to be burned at one end and outlet means for all of the volatile products of combustion at the other end, means in the chamber to move refuse continuously from the feeding means toward said outlet means in a single direction concurrent with the flow of gases, said chamber having a substantially flat heat-reflecting arch above said refuse moving means disposed angularly upwardly in the direction of movement of the refuse to radiate heat to dry and to support self-combustion of said refuse, said refuse feeding means including confining walls defining a refuse inlet passage of progressively increasing width and depth whereby refuse is "fluffed up" by lateral and downward displacement as it

is fed into the chamber, said furnace chamber being also provided with inlet ports disposed at the sides and bottom of said refuse inlet passage and communicating with said furnace chamber to introduce air into the interior of the refuse while being "fluffed up."

3. In an incinerator for continuous burning of raw refuse, a horizontally disposed furnace chamber having inclined refuse feeding hopper means at one end to introduce into the incinerator all products including raw refuse to be consumed therein and outlet means for all volatile products of combustion at the other end, a single traveling grate means in the chamber to move burning refuse from said hopper means toward said outlet means, the cross-sectional area of said chamber being of progressively increasing size in the direction from said hopper means to said outlet means, said chamber having side walls to confine refuse on said traveling grate means, said inclined hopper means having side walls terminating in vertical forward edges inwardly spaced from the side walls of the chamber whereby when refuse is transferred from said hopper means to said grate means said refuse is subjected to lateral "fluffing up" action, and means to admit air communicating with the vertical space thus provided between the side walls of the chamber and the forward edges of the hopper whereby said air is fed to the major portion of the refuse being laterally displaced from the side walls of the hopper means to the side walls of the chamber.

4. In an incinerator for continuous burning of raw refuse, a horizontally disposed furnace chamber having inclined refuse feeding hopper means at one end to introduce all products including raw refuse and outlet means for all volatile products of combustion at the other end, a single traveling grate means in the chamber to move burning refuse from said hopper means toward said outlet means, the cross-sectional area of said chamber being of progressively increasing size in the direction from said hopper means to said outlet means, said chamber having side walls to confine refuse on said traveling grate means, said inclined hopper means having side walls inwardly spaced from the side walls of the chamber and a bottom wall comprising a plurality of transverse sections disposed in spaced downwardly offset relationship whereby refuse is "fluffed up" by downward displacement in passing between said transverse sections and by lateral displacement in passing from the side walls of the hopper means to the side walls of the furnace chamber above the grate means, said chamber being provided with means to admit air between said spaced transverse sections and between said spaced side walls to the refuse passing between said transverse bottom sections and passing between said respective side walls.

5. In an incinerator for continuous burning of refuse, a horizontally disposed furnace chamber having inclined refuse feeding hopper means at one end to introduce to the incinerator all materials to be burned therein and outlet means for all of the volatile products of combustion at the other end, a single traveling grate means in the chamber to move the refuse from said hopper means toward said outlet means, the cross-sectional area of said chamber being of progressively increasing size in the direction from said hopper means to said outlet means, said chamber having side walls to confine refuse on said traveling grate means, said inclined hopper means having side walls inwardly spaced from the side walls of the chamber and an inclined bottom wall, the lower edge of said bottom wall being spaced above said traveling grate means whereby refuse is "fluffed up" by passing from said lower edge of the inclined bottom wall and by lateral displacement in passing from the side walls of the hopper means to the side walls of the furnace chamber above the grate means, said chamber being provided with means to admit air between said lower edge of the bottom wall and the grate and between said respective spaced side walls to the refuse passing from the lower edge of the inclined bottom wall

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to the gate means and to the refuse passing between said respective side walls.

6. In an incinerator for continuous burning of refuse, a horizontally disposed furnace chamber having refuse feeding means to introduce continually all products at one end to be burned in the incinerator and outlet means for volatile products of combustion at the other end, traveling grate means in the chamber to move burning refuse from said feeding means toward said outlet means, said chamber having a substantially flat heat-reflecting arch above the traveling grate means disposed angularly upwardly toward said outlet means, said refuse feeding means having side walls inwardly spaced from the side walls of the chamber and an inclined bottom wall comprising a plurality of transverse sections disposed in spaced downwardly offset relationship, the lowermost of said sections being spaced above the traveling grate means whereby refuse is "fluffed up" by passing over said transverse sections onto said grate means and by lateral displacement in passing from the side walls of the feeding means to the side walls of the furnace chamber above the grate means, said chamber being provided with means to

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admit air to the space between said transverse sections the space between the lowermost section and the grate means and the space between said respective side walls.

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