

Sept. 4, 1934.

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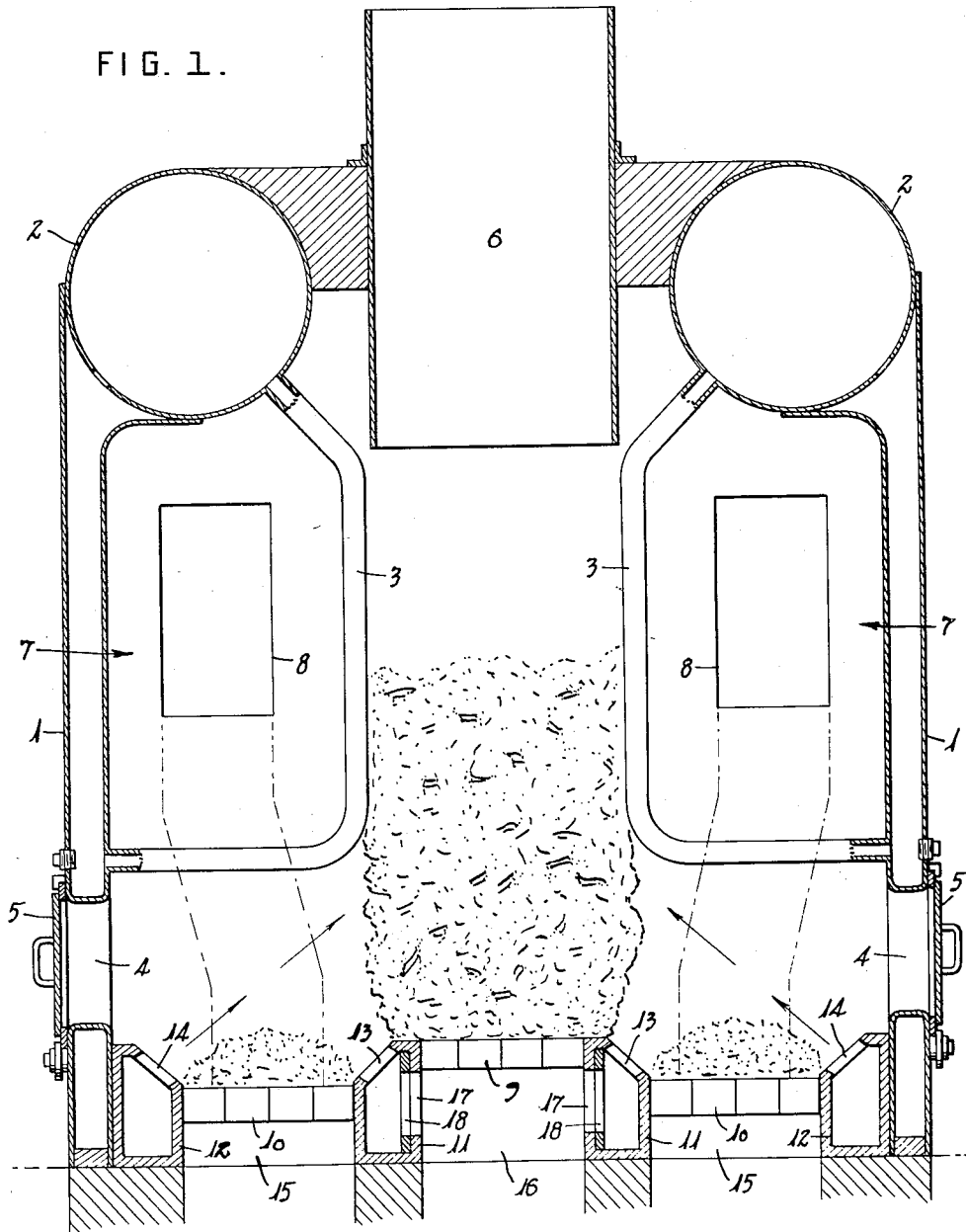
1,972,429

INCINERATOR

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4 Sheets-Sheet 1

FIG. 1.



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FIG. 2.

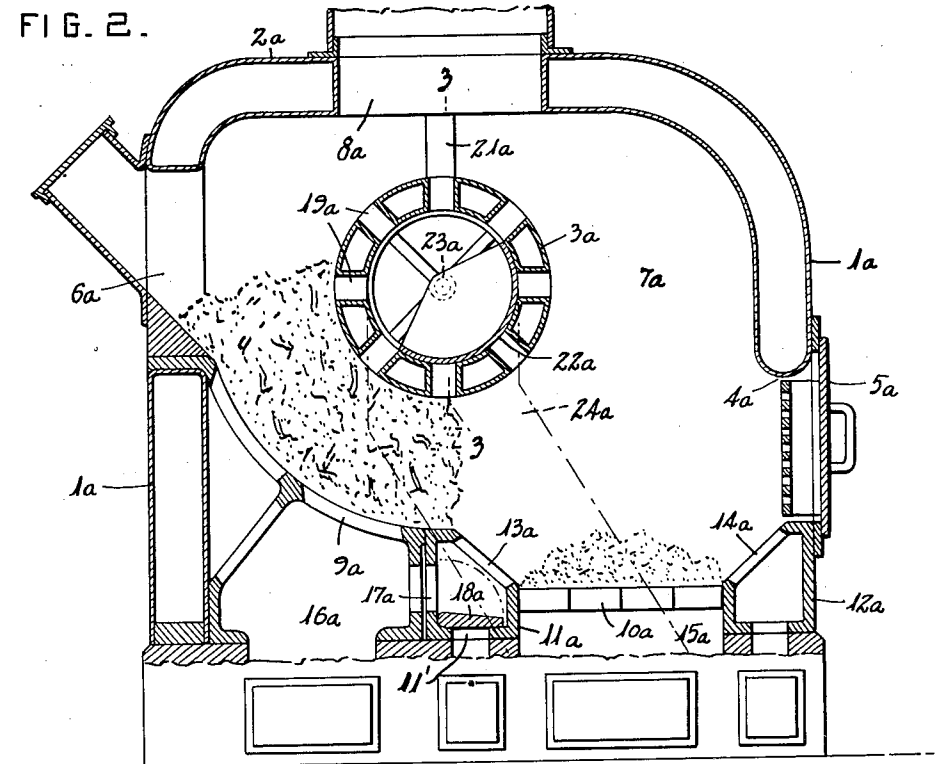
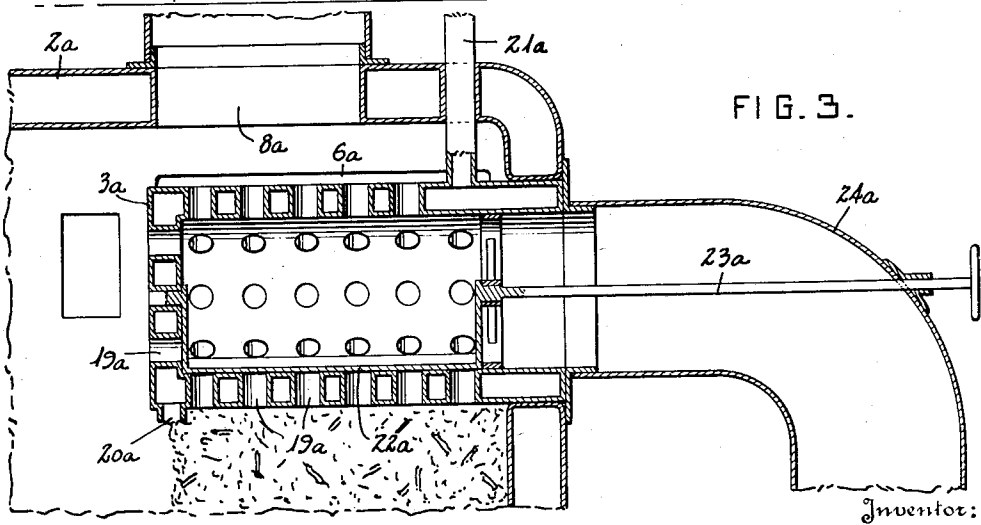


FIG. 3.



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FIG. 4.

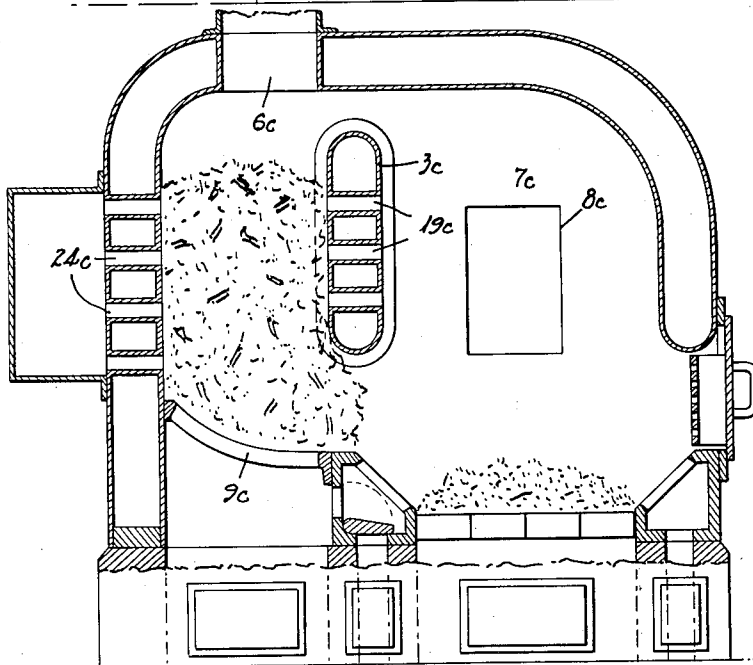
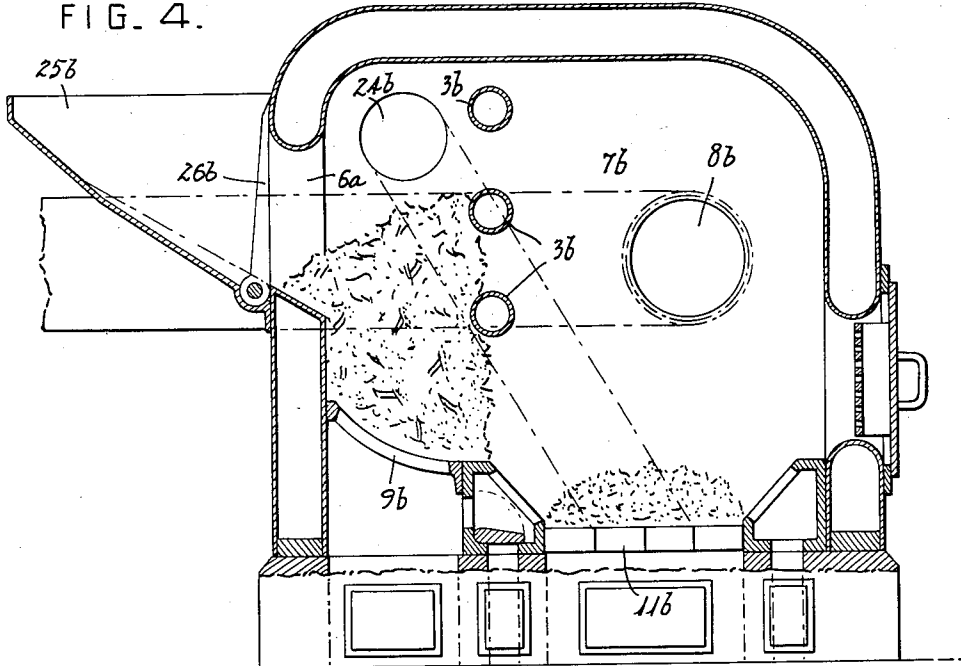


FIG. 5.

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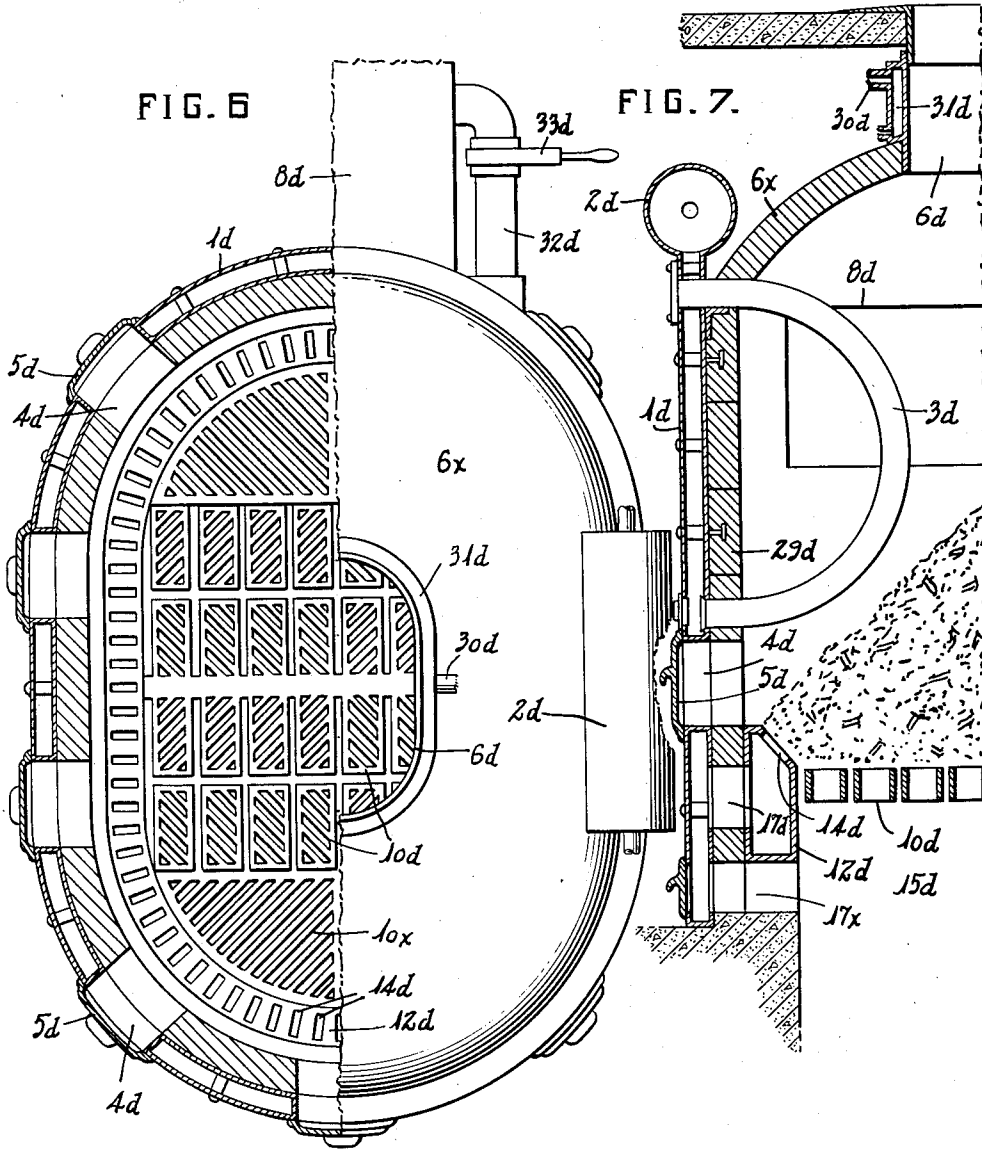
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# UNITED STATES PATENT OFFICE

1,972,429

## INCINERATOR

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Application May 7, 1930, Serial No. 450,444

5 Claims. (Cl. 110—8)

The present invention relates to refuse or garbage incinerators, and is an improvement over the incinerators disclosed in my Patent Nos. 1,479,875 and 1,651,636, granted January 8, 1924 and Dec. 6, 1927, respectively.

One of the objects of the invention is the provision of an incinerator having a novel and improved grate and air feeding arrangement in order to facilitate the drying of the refuse or garbage and the combustion thereof.

Another object is the provision of a novel arrangement for accommodating and holding the refuse or garbage delivered into the incinerator to facilitate drying thereof.

A further object is the provision of means to accommodate the refuse or garbage and to provide for the free outlet of the products of combustion.

With the foregoing and other objects in view, which will be apparent as the description proceeds, the invention resides in the construction and arrangement of parts, as hereinafter described and claimed, it being understood that changes can be made within the scope of what is claimed, without departing from the spirit of the invention.

The invention is illustrated in the accompanying drawings, wherein—

Figure 1 is a cross section of one type of incinerator embodying the improvements.

Fig. 2 is a cross section of another type of incinerator embodying the improvements, portions being shown in elevation.

Fig. 3 is a section on the line 3—3 of Fig. 2.

Figs. 4 and 5 are cross sections of other modifications.

Fig. 6 is a view, partly in plan and partly in horizontal section of another modification.

Fig. 7 is a transverse vertical section thereof.

Referring to Fig. 1 the furnace has the side walls 1 which are of sheet metal and hollow to hold water, and they are attached at their upper portions to and communicate with parallel cylindrical tanks 2 for holding water and steam.

Tubes 3 located within the furnace are connected at their upper ends with the tanks 2 and their lower ends are connected with the walls 1 above the door openings 4 therein immediately above the grate and air heating structure.

The openings 4 are normally closed by doors 5 which may be slid open to give access to the material on the grates for agitating same.

The top of the furnace has an inlet 6 through which the refuse or garbage is dropped into the space or magazine provided between the tubes 3,

and said tubes provide free and unencumbered spaces 7 between said tubes and the walls 1 from which the outlets 8 lead to conduct the products of combustion from the furnace.

The base of the furnace has a central raised grate 9 below the inlet 6 and spaced below the tubes 3, to provide a bottom for the magazine, to support the column of material thereon.

At the opposite sides of the grate 9 and below the spaces 7 are the grates 10 on which the material is burned after being dislodged from over the grate 9.

Air ducts 11 are located between the grates 9 and 10, and air ducts 12 are located between the grates 10 and walls 1. Said ducts 11 and 12 have the inclined slotted walls or grates 13 and 14, respectively, at the opposite sides of the grates 10 to direct air at an angle over the material on the grates 10, air being delivered into the ducts 11 and 12 from a blower.

There are air channels or spaces 15 under the grates 10, and there is an air channel or space 16 under the grate 9, from which air flows upwardly through the grates, and it is preferable to return the heavier products of combustion from the outlets 8 to the channels 15 in order that unburned matter may be consumed in passing through the fire, although the outlets 8 may lead to any other point of discharge.

The air ducts 11 have openings or slots 17 communicating with the channel 16 and controlled by shutters 18, to permit the heat from the burning material on the grates 10 to pass through the slotted grate walls 13 and the openings 17 when the shutters 18 are moved to open position. This passage of heat through the ducts 11, with the air shut off from said ducts, will assist materially in heating the garbage or refuse on the grate 9.

It will also be noted that air discharged through the grate walls 14 will pass over the burning material on the grates 10 and will be directed against the opposite sides of the column of garbage in the magazine, as indicated by arrows in Fig. 1, to assist in drying the wet material. If air enters through both the grate walls 13 and 14, then the streams intercept one another above the grates 10 and are directed upwardly into the spaces 7.

With the present construction the garbage in the magazine will move down freely between the tubes or bars 3, and will be heated from opposite sides to dry same. The material on the grate 9 may also be heated from underneath by opening the shutters 18 and shutting off the air from

the ducts 11, so that the heat from the burning material on the grates 10 passes through the slotted walls 13 and openings 17.

As the material on the grate 9 becomes dry it falls over the walls 13 onto the grates 10, or the doors 5 may be opened for loosening the material so that it falls on the grates 10. The products of combustion may flow freely from the material on the grates 10 into the spaces 7 and out through the outlets 8, thereby heating the material in the magazine. The products of combustion are preferably returned to the channels 15 so as to pass through the fire in order that any unburned matter will be consumed.

When air flows from the ducts 11 through the slotted walls 13 thereof it passes between the material on the grates 9 and 10, to separate same and to enable the material on the grates 10 to be burned thoroughly.

The furnace shown in Figs. 2 and 3 has a single combustion grate 10a, whereas the structure shown in Fig. 1 has a double combustion grate 10. The side walls 1a and top 2a of the casing are preferably hollow to contain water to be heated, and one wall has the garbage or refuse inlet 6a immediately above the sloping magazine grate 9a. The opposite wall has the door opening 4a and doors 5a which may be opened for access to the materials on the grates.

An air duct 11a is disposed between the grates 9a and 10a and has the inclined slotted wall 13a, and an air duct 12a is disposed at the opposite side of the grate 10a and has an inclined slotted wall 14a. Air channels or passages 15a and 16a are provided under the grates 10a and 9a, respectively, and the duct 11a has the opening 17a to permit heat to pass from over the grate 10a under the grate 9a. A swinging valve or shutter 18a in the duct 11a is adapted to alternately close the openings 17a and the air inlet openings 11' in the bottom of the duct 11a, so that the flow of air into the duct is shut off when the openings 17a are uncovered, and when the shutter closes the openings 17a then the openings 11' are uncovered to admit air into the duct.

The base and grate construction has the same advantages as that of the furnace shown in Fig. 1, excepting that the material on the grate 9a falls in only one direction to the single grate 10a. The grate 9a being inclined, however, will facilitate the movement of the dried material from said grate to the grate 10a.

The top 2a has an outlet 18a for the products of combustion passing upwardly from the material burning on the grate 10a, and a hollow smoke-outlet member 3a extends into the furnace above the grate 9a and cooperates with said grate to provide the magazine for the garbage or refuse dumped through the inlet 6a. There is a free space 7a between the member 3a and the wall of the furnace opposite to the garbage inlet 6a to permit the products of combustion to rise from the grate 10a to the outlet 8a without restriction.

The member 3a is preferably of doubled-walled construction for holding water to be heated by the furnace, and flues 19a extend through said walls to permit the smoke and green gases to pass into said member. Water inlet and outlet pipes 20a and 21a are connected to the member 3a for the flow of water, and said member may be in communication with the chamber of the walls 1a and top 2a.

An arcuate valve 22a is movable in the member 3a to close some of the flues or openings 19a, and

has a shaft 23a extending to the exterior of the furnace for conveniently controlling said valve.

A return pipe 24a communicates with the member 3a and with the channel 15a and may contain a blower for drawing the smoke and gases and delivering same into the channel 15a to pass up through the burning material on the grate 10a so that unburned combustible particles will be consumed by the flames.

The material on the grate 9a being heated will give off green gases and smoke, which will be drawn through the flues or openings 19a into the member 3a and delivered through the pipe 24a into the channel 15a to be consumed by the flames, thereby providing a smoke consumer. The valve 22a is readily adjusted so that the green gases and smoke rising from the material in the magazine will pass into the member 3a, while the products of combustion from the material on the grate 10a will pass upwardly to the outlet 8a. The member 3a thus serves as a smoke separator, being arranged between the material in the magazine and the space 7a.

Fig. 4 illustrates, in place of the member 3a of Figs. 2 and 3, water tubes 3b connected to the casing, for the flow of water through said tubes, and spaced vertically to provide a magazine between said tubes and the wall of the casing which has the garbage inlet 6a. Said tubes also separate the garbage from the space 7b from which the outlet 8b leads. The casing has the smoke and green gas outlet 24b at the upper portion of the magazine to draw off the smoke and green gases, which are delivered below the grate 11b to be consumed by the flames.

The grate 9b forming the bottom of the magazine, is inclined to discharge the dried material to the grate 11b below the tubes 3b.

A hopper 25b is disposed outside of the inlet 6a, and a shutter or valve 26b is hingedly mounted in said hopper to close said inlet, and rests against the inclined wall of the hopper when said shutter is swung open. The shutter 26b is so arranged that any material remaining thereon in the hopper 25b, will be dumped through the inlet 6a when said shutter is closed.

Fig. 5 illustrates another variation including a hollow partition member 3c in the furnace to provide the magazine, and to separate the material from the space 7c from which the outlet 8c leads.

Said member 3c has flues 19c through same for the passage of heat from the grate 7c into the wet material. The garbage inlet 6c is in the top of the casing, and the corresponding wall of the casing has outlet openings or flues 24c above the grate 9c through which the green gases and smoke are drawn from the garbage in the magazine, the flues or openings 19c permitting the heated products of combustion to be drawn from the space 7c through the garbage. This arrangement provides for the flow of heated gases from the combustion chamber through the material in the magazine to facilitate drying of the material, and to draw off the green gases and smoke, which may be delivered to the fire for consumption.

Figs. 6 and 7 illustrate an incinerator of elliptical outline, including the doubled walled jacket 1d of elliptical shape, having the air inlet chambers 2d at the upper portions of its opposite sides. The jacket or casing is provided at suitable points surrounding the firepot with the openings 4d normally closed by the doors 5d, and the top 6d has the elliptical or elongated refuse inlet 6d

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through which the refuse, garbage or other matter is dumped into the incinerator.

An outlet flue 8*d* for the products of combustion leads from the rear end of the jacket or casing to the smoke stack (not shown), and a suitable shaking bottom grate 10*d* is provided, which may be composed of hollow sections for the circulation of water, air or other cooling fluid.

An air duct 12*d* surrounds the bottom grate, which has the sector-shaped sections 10*x* at the ends, and said duct has an inclined wall forming a side grate and provided with slots 14*d* through which air may flow across the bottom grate.

The structure has openings 17*d* between the jacket and the duct 12*d* so that air flowing into the jacket and preheated therein will flow into the duct 12*d* to pass through the slots 14*d* into the combustion chamber. As shown, there are also openings 17*x* leading from the jacket below the duct into the channel or space 15*d* below the grate 10*d* for the flow of air upwardly through the material on said grate.

As shown, the jacket 1*d* has a lining composed of refractory blocks 29*d* which are anchored to the jacket, to retain the heat as much as possible within the incinerator, and the heat which penetrates the lining is transmitted to the air flowing through the jacket.

The inlet portion 6*d* has a cooling jacket 31*d* surrounding same and provided with suitable air inlets, and one or more pipes 30*d* lead from said jacket to the flue 8*d* or to the smoke stack or other suitable point of discharge, and a blower may be used to increase the flow of air.

Pipes 3*d*, corresponding with the pipes 3 as shown in Fig. 1, have their intermediate portions disposed within the furnace, and have their upper terminals extending through the jacket 1*d* for the inlet of air. The lower ends of the pipes 3*d* are secured through the inner wall of the jacket, so that the air is delivered into said jacket after being heated within said pipes. This provides for the pre-heating of the air in flowing through said pipes into the jacket. The chambers 2*d* may be used for the inlet of air also, or for the outlet of air, as may be desired or advantageous.

A pipe 32*d* connects the jacket 1*d* with the flue 8*d* or the smoke stack, and has a valve 33*d* which may be opened for drawing the air from the jacket into the flue when the discharge of air from the jacket through the openings 17*d* and 17*x* is not wanted. The valve 33*d* when closed will result in the air flowing from the jacket 1*d* through the openings 17*d* and 17*x*.

The elliptical type of incinerator has advantages over the circular or rectangular shape, and the incinerator may be made of different lengths with the rounded ends.

In each of the furnaces disclosed the grates may be hollow for the circulation of water or air therein for cooling same and taking off heat that may be used to advantage.

Having thus described the invention what is claimed as new is:

1. An incinerator having magazine and combustion grates arranged side by side with the combustion grate at a lower level than the magazine grate, an air duct between said grates having a slotted wall to discharge air between said grates and having openings to permit heat to pass from said slotted wall under the magazine grate, and means for closing said openings so that air introduced into said duct is discharged through the slotted wall between said grates.

2. An incinerator having substantially parallel magazine and combustion grates arranged side by side with the combustion grate at a lower level than the magazine grate, an air duct having a slotted wall extending between said grates, and an air duct at the opposite side of the combustion grate and having a slotted wall for directing air over the combustion grate toward material on the magazine grate.

3. An incinerator having substantially horizontal and parallel magazine and combustion grates arranged side by side with the combustion grate arranged at a lower level than the magazine grate, an air duct between said grates having an inclined slotted wall to discharge air upwardly and laterally across the combustion grate, and said air duct also having openings to permit heat to pass through said openings and slotted wall to the underside of the magazine grate, and a manually operable slideable closure member arranged within said air duct to open or close said openings so that air introduced under pressure into said duct is discharged through the slotted wall between said grates when the openings are closed.

4. In a refuse incinerator, a substantially horizontal refuse supporting grate, means including spaced water circulating pipes defining with said grate, a refuse magazine, a substantially horizontal fuel grate disposed to one side of and at a lower level than said refuse grate, an air duct substantially coextensive with and disposed between said grates, said air duct having a slotted upper wall disposed at an incline and bridging the space between said grates, a second air duct at the opposite side of said fuel grate provided with openings directed across said fuel grate toward said refuse magazine.

5. An incinerator having a refuse magazine provided with a refuse supporting grate at the bottom thereof, a fuel grate at one side of the magazine and at a lower level than said refuse grate to receive material dropped to one side from the magazine, an air duct having a slotted wall extending between said grates, and means for introducing air under pressure across said fuel grate from the side thereof opposite from the magazine toward the material in said magazine.

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