

F. L., A. S. & L. A. R. DECARIE.
INCINERATOR.

APPLICATION FILED FEB. 9, 1909.

Patented June 24, 1913.

2 SHEETS-SHEET 1.

1,065,864.

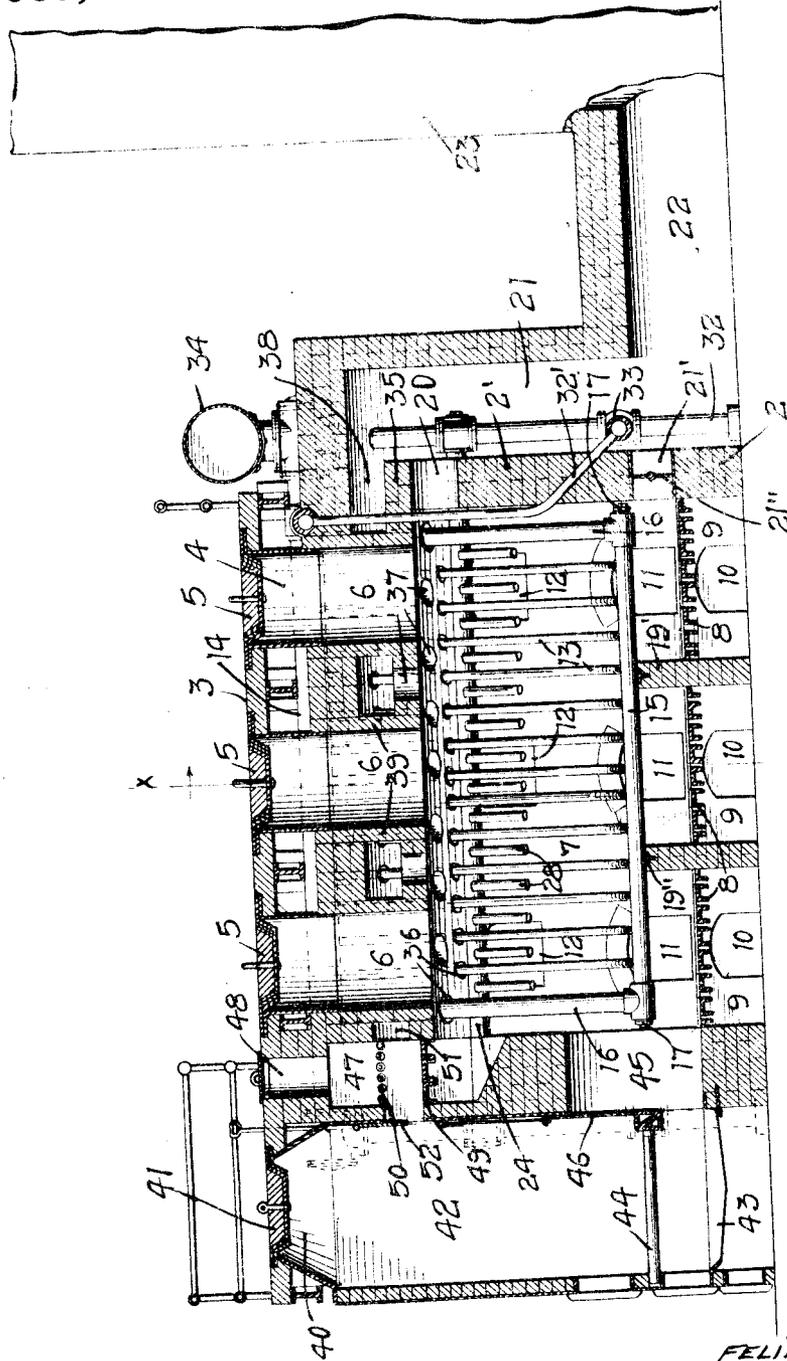


Fig. 1.

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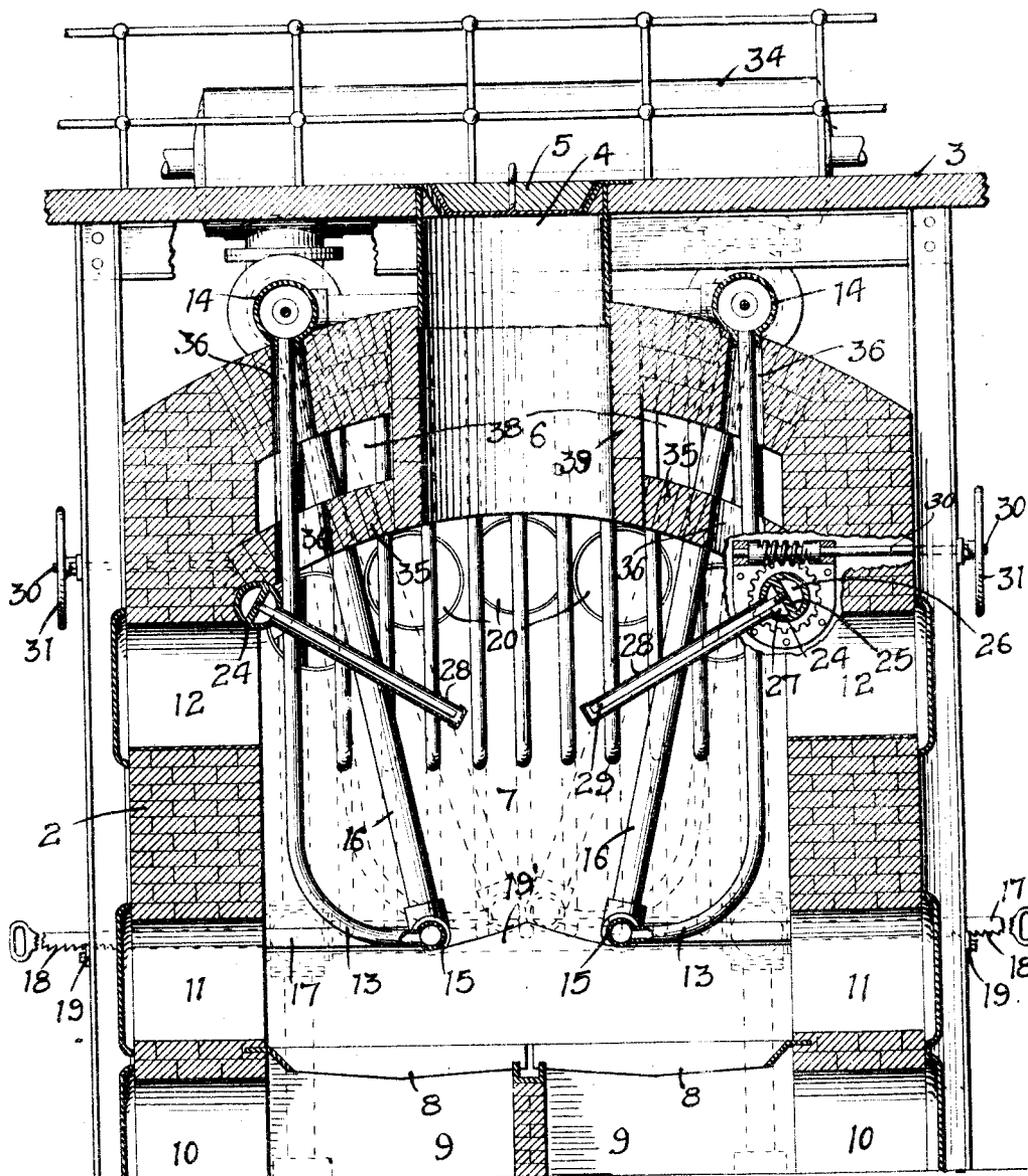


Fig. 2. x-x

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UNITED STATES PATENT OFFICE.

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INCINERATOR.

1,065,864.

Specification of Letters Patent.

Patented June 24, 1913.

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To all whom it may concern:

Be it known that we, FELIX L. DECARIE, ALEXANDER S. DECARIE, and LOUIS A. R. DECARIE, all of Minneapolis, Hennepin county, Minnesota, have invented certain new and useful Improvements in Incinerators, of which the following is a specification.

The object of our invention is to provide an incinerator of simple, inexpensive construction and one which will be economical of operation and easily handled.

A further object is to provide an apparatus that is capable of application to crematories which are already installed and in operation.

A further object is to provide an incinerator having a gas consuming chamber in which the products of combustion and the gases arising from the material will be consumed before entering the stack.

A further object of our invention is to provide means in the combustion chamber for dividing or separating the material to be consumed to facilitate its combustion, preventing the packing together of wet material, which will sometimes occur where only one grate is employed, the upper suspended grate being so constructed that the material thereon can be discharged upon the lower or stationary grate at any time.

Our invention consists generally in a hanging or suspended grate, which can be used or not, as desired.

Further, the invention consists in providing headers above said suspended grate whereon a portion of the material to be consumed may be supported.

Further, the invention consists in providing a grate and combustion chamber adapted to receive inflammable material such as paper.

Further, the invention consists in circulating tubes to permit the heat of the burning material to be utilized to generate steam for commercial purposes.

Further, the invention consists in a gas consuming furnace having a hopper leading to the dumping floor, by means of which we are enabled to use combustible material on the down draft grate and dispense with the use of commercial fuel on these grates, except where there is a scarcity of combustible material in the waste supply to the crematory.

Further, the invention consists in various constructions and combinations all as hereinafter described and pointed out in the claims.

In the accompanying drawings, forming part of this specification, Figure 1, is a longitudinal, vertical, sectional view of an incinerator embodying our invention, Fig. 2, is a transverse, vertical, sectional view of the same on the line X—X of Fig. 1.

In the drawing, 2 represents a brick casing or setting having a roadway 3 thereon, provided with a series of filling openings 4 normally closed by covers 5. These covers are preferably composed of a combination of metal and concrete, as shown. Below these covers are feed spouts 6 leading to a combustion chamber 7. We have shown three of these filling openings in the roadway, but the number may be increased or decreased according to the capacity of the incinerator.

In the bottom of the combustion chamber we provide a series of grates 8, having ash pits 9, which are accessible through doors 10. Openings 11 and 12 are provided in the wall of the casing through which access may be had to the space above the grates 8 and the combustion chamber 7. It often happens in an apparatus of this kind, that the material is wet and soggy and when thrown into the combustion chamber, will pack down around the grate and prevent the fire from working through the mass and igniting the combustible material. To obviate this difficulty, we provide a suspended or hanging grate consisting of a series of tubes 13, connected at their upper ends to a pipe 14, and having inwardly turned lower ends which are connected to a pipe 15, which extends from end to end of the combustion chamber. Pipes 16 are attached to the ends of the pipe 15 and project up through the crown of the combustion chamber and are connected with pipes 14. These pipes 14 are capable of oscillation in their supports to allow the sections of the hanging grate to move back and forth toward or from one another to close the space between the sections and support the material deposited thereon or allow the material to drop through upon the stationary grates 8 beneath. We prefer to provide suspended sections with inwardly and downwardly curved lower portions so that the material carried by the basket sections will tend to work toward the center of the cham-

ber and toward the space between the sections. This movement of the material will be facilitated when the sections are swung apart to widen the discharge opening between them and allow the material to fall upon the stationary grate beneath. The pipes 16, provided at the ends of the sections are, as shown in Fig. 2, inclined to form guides to direct the material contacting therewith toward the middle portion of the chamber. This construction prevents the material from packing down in the basket and greatly facilitates the handling of the load on the grate. These hanging grate sections are oscillated by any suitable means as by bars 17 having teeth 18 adapted to engage plates 19 and lock the grate sections in any desired angle in the combustion chamber. The space below the hanging grate is divided transversely by walls 19', having plates 19'' on which the lower ends of the swinging sections of the grate ride. The pipes composing the hanging grate are thus supported when the grate is loaded. The walls 19' having a further function of dividing the lower stationary grate into a series of sections so that one or more fires may be maintained on the grate, and one fire can be stirred, if necessary, without disturbing the fires on the other sections of the grate. The combustion chamber has a series of flues 20 leading therefrom to a descending flue 21, which has a horizontal extension 22 communicating with the stack 23. A horizontal flue 21' leads from the space below the hanging grate to the descending flue 21, and is provided with a valve 21'' by means of which the passage of the products of combustion through the flue may be regulated. By means of this flue we are able to conduct the gases and products of combustion from the paper consuming chamber through the main combustion chamber of the incinerator to the stack without passing the products of combustion into the gas consuming chamber. The flues 20 extend through a baffle wall 2' provided at the rear of the combustion chamber and separating it from the descending flue 21. Above the lower portion of the hanging grate we provide headers consisting of horizontal pipes 24 arranged on each side of the combustion chamber and provided with longitudinal partitions 25, which divide their interior into chambers 26 and 27. A series of pipes 28 communicate with the chambers 27 and a series of smaller pipes 29 are arranged within the pipes 28 and communicate with the chambers 26. When, therefore, water enters the chambers 27 and flows down into the pipes 28, it must enter the pipes 29 and flow therethrough before entering the chambers 26. The pipes 28 and 29 project laterally from the pipes 24 into the combustion chamber and are raised or lowered by the oscillation of the pipes 24 and this oscillation takes place by any suitable means, as the shafts 30, having operating wheels 31 and suitably connected with the pipes 24. By this means, the pipes 28 and 29 may be swung down to an inclined inoperative position or raised to a horizontal position, where they will cooperate with one another to form another grate upon which the material from the spouts will be deposited. With this apparatus, we are able to divide material delivered to the incinerator, a portion falling on the stationary grate 8 in the bottom of the combustion chamber, a portion being supported by the oscillating suspended grate above and a third portion being caught and held by the headers in the upper portion of the combustion chamber. By dividing the material in this way into separate masses, we increase the surface exposed to the action of combustion and prevent the material from packing and becoming so firmly embedded in the bottom of the combustion chamber, as to prevent the flames from working through the mass and reaching the combustible material. When the material on the lower stationary grate becomes well ignited, the contents of the suspended grate above being dried by its exposure to the heat from beneath, may be discharged into the bottom of the combustion chamber and then finally the load on the headers can be dropped and consumed.

A circulation of water is maintained through the suspended grate and the headers by means of the upright pipes 32, arranged in pairs at each end of the combustion chamber, the opposite pipes of the same pair being connected by cross pipes 33, through which the water supply may be introduced, if preferred. A steam drum 34 is mounted on the upper wall of the combustion chamber above the flue 21 and connected with the circulating pipes and from this drum, steam may be drawn for commercial or power purposes. The combustion chamber has a crown wall 35 provided with a series of openings 36 in which the pipes of the suspended grate are adapted to oscillate and also provided with holes 37, through which the gases from the material beneath and from the products of combustion may pass into a gas consuming chamber 38 that is formed between the crown wall 35 and the top of the incinerator and extends around the lining 39 of the spouts through which the material is discharged into the combustion chamber. The walls of this combustion chamber are composed of fire brick, which is heated to a high temperature and has the effect of igniting the gases therein and effecting their combustion and consumption, before reaching the flue 21, which leads into the stack. At the rear of the combustion chamber we provide a series of circulating pipes 32', communi-

cating with the upright pipes 32 and with the headers at the top of the incinerator. These circulating pipes, as indicated in Fig. 2, extend across the flues leading from the combustion chamber and have the effect of preventing any light material from being drawn out of the combustion chamber into the stack, and, at the same time, enable us to materially increase the circulating surface for the generation of steam.

At one side of the roadway is a filling opening 40 having a cover 41, corresponding to those heretofore described and leading to a combustion chamber 42, in the bottom of which is a stationary grate 43 and a water grate 44, so called because it is composed of tubing and connects with the circulating pipes, heretofore described. This combustion chamber connects with the chamber 7 through a passage 45 and, when desired, the valve 46 is adjusted so that the flames and products of combustion will be drawn down through the grate 44, for the purpose of heating the water therein and increasing the supply of steam to the drum 34. This combustion chamber 42 is designed particularly to receive such waste material as paper and other garbage, of a combustible nature and the ignition of this material in this chamber will have the effect of heating the walls of the gas consuming chamber, so that combustion and consumption of the gases will take place therein before the material in the chamber 7 has become sufficiently ignited to heat the walls of the gas consuming chamber.

We also provide a combustion chamber 47 having a filling opening 48 and grates 49 and 50 arranged one above another and communicating through a flue 51 with the gas consuming chamber. The grate 50 is connected with the circulating pipes and combustible material is placed on the grates 49 and 50 for the purpose of effecting a preliminary heating of the walls of the gas consuming chamber. This combustion chamber 47 has a valve 52 through which communication may be had with the chamber 42 and this valve may be opened to allow the smoke and products of combustion from the chamber 42 to pass through into the flue 51 and the gas consuming chamber. This valve will be opened when the material is burning in the chamber 42 and it is desired to charge the chamber again and except for this valve the smoke and products of combustion would escape from the combustion chamber. The heating of the walls of the gas consuming chamber also has the effect of creating a draft and hastening the combustion of the material on the grates.

The grates 44 and 50 are constructed on the header principle, illustrated in Fig. 2, there being a longitudinally divided pipe at one side of the grate from the chambers

of which horizontal pipes radiate and are arranged within one another, as indicated in Fig. 2.

By suspending a hanging grate above the crown in the gas consuming chamber, we are able to apply this attachment to crematories, which are already in use. Some crematories are constructed with crowns so low that there would be no room for suspending the hanging grate below the crown. The use of this hanging grate enables us to utilize the heat from the lower grate to burn the suspended material and the auxiliary gas consuming furnace is heated to a high degree of temperature by the flames from the burning suspended material and the gases and products of combustion passing through the superheated gas consuming furnace will be entirely consumed before reaching the stack. Through the feed spout or hopper of the gas consuming furnace, combustible material can be delivered to the down draft grate, rendering it unnecessary to burn a commercial fuel on this grate when there is sufficient combustible material in the garbage. A considerable saving is thus effected in the cost of operating the plant. By locating the gas consuming furnace above and in front of the suspended grate, it is only necessary to burn a small amount of material to obtain a high degree of temperature in the furnace sufficient to destroy all noxious odors before they can reach the stack. We prefer to build a gas consuming chamber of fire brick, which will absorb and retain the heat and by providing a series of openings in the crown wall of the combustion chamber, the gases will be divided and coming in contact with the refractory material forming the wall of the chamber, will be more rapidly and fully consumed.

We claim as our invention:—

1. In an incinerator, the combination, with a combustion chamber and a stationary grate therein, of a suspended or hanging grate arranged above said stationary grate and composed of oscillating sections arranged to swing toward or from one another, and means for operating said sections, each section including a series of bars hinged at their upper ends and having inwardly curved lower ends.

2. In an incinerator, the combination, with a combustion chamber, of a grate composed of depending opposing sections having inwardly turned lower portions, said sections being hinged and capable of swinging toward or from one another and a fire grate arranged below said first named grate.

3. In an incinerator, the combination, with a combustion chamber, of a stationary grate in the lower part thereof, a second grate composed of oscillating vertical sections arranged above said first named grate

- and depending from the top of said chamber, and a third grate also composed of oscillating sections located in the upper part of said combustion chamber; said second and third grates being arranged to support a portion of the material deposited in said combustion chamber and support it in proximity to the material deposited on the lower grate, but without contacting therewith, for the purpose specified.
4. In an incinerator, the combination, with a combustion chamber having a lower stationary grate, of a hanging grate composed of sections suspended at their upper ends and depending vertically within said combustion chamber and having inwardly curved lower ends and capable of movement toward or from one another, and a third grate composed of sections arranged to oscillate in said combustion chamber and support the material above the lower portion of said second grate, substantially as described.
5. In an incinerator, the combination, with a horizontal combustion chamber and a basket grate composed of oscillating sections in said combustion chamber, of a vertical paper combustion chamber having a top filling opening and a grate in its lower portion, the walls separating said horizontal combustion chamber and said paper combustion chamber being provided with an upper flue near the top of said paper combustion chamber and a lower flue near the bottom of said chamber, said lower flue being below the level of the basket grate in said horizontal combustion chamber, and a damper arranged to close said upper flue and compel the products of combustion to pass through said lower flue.
6. In an incinerator, the combination, with a combustion chamber having a filling opening and a grate, of a combustion chamber for light material having a filling opening and communicating with said main combustion chamber, a gas consuming chamber provided above said main combustion chamber, an auxiliary furnace provided between said gas consuming chamber and said combustion chamber for light material, and communicating with the latter, and having a flue leading into said gas consuming chamber, said auxiliary furnace being also provided with a filling opening, for the purpose specified.
7. In an incinerator, the combination, with a horizontal combustion chamber having a grate and a top filling opening, and a gas consuming chamber inclosing said filling opening, the crown of said combustion chamber having openings leading to said gas consuming chamber, a descending flue provided at one end of said combustion chamber and communicating with the upper part thereof and with said gas consuming chamber, the rear wall of said combustion chamber forming a baffle wall between it and said flue, substantially as described.
8. In an incinerator, the combination, with a horizontal combustion chamber having a grate and a top filling opening, and a vertical flue in the rear of said chamber communicating with the upper portions thereof, the rear wall of said chamber forming the front wall of said flue, and having ports between said flue and said chamber in the upper part of said wall, a second grate composed of oscillating sections, a series of circulating tubes arranged within said combustion chamber and extending across the ports of said wall.
9. In an incinerator, the combination, with a combustion chamber and grate, of walls dividing the space above said grate transversely into separate compartments, and a suspended grate composed of oscillating sections adapted to rest on said walls and slide thereon, substantially as described.
10. In an incinerator, the combination, with a combustion chamber having a filling opening and a grate, of transverse walls extending above said grate and dividing the space in the lower part of said combustion chamber into separate compartments, and each space having a door in the wall of said chamber leading thereto, and a grate composed of separable sections arranged to slide on said walls, for the purpose specified.
11. In an incinerator, the combination, with a combustion chamber having a crown provided with openings therethrough, of a suspended grate composed of sections arranged with a space between them, said sections consisting of tubing projecting up through said openings in the crown of said combustion chamber and hinged above the crown of said chamber and adapted to swing back and forth toward and from one another in said openings, substantially as described.
12. In an incinerator, the combination, with a combustion chamber having a crown and a lower grate, of an upper suspended grate composed of hinged sections depending from the crown of said chamber, said sections having inwardly curved lower portions with a space between them, substantially as described.
13. In an incinerator, the combination, with a horizontal combustion chamber and its grate, a second grate composed of oscillating sections within said combustion chamber, the rear wall of said combustion chamber having a series of flue openings in its upper part, vertically arranged circulating tubes extending across said flue openings and having their upper ends supported in the top of said combustion chamber, and their lower ends embedded in the middle portion of the rear wall of said combustion chamber, substantially as described.

14. In an incinerator, a combustion chamber having filling openings and a grate, and a crown arch having a gas consuming chamber formed therein and having flue holes leading to said combustion chamber, and a basket having bars depending through the flue holes leading to said gas consuming chamber, and the lower portion of said basket being adapted to receive and support material discharged through said filling openings:
15. In an incinerator, a combustion chamber having a grate and provided with filling openings and a crown arch having a combustion chamber formed therein and having flue holes communicating with said combustion chamber, a basket composed of sections hinged above said crown wall and having bars depending through said flue holes and the bars of the opposite sections being movable toward and from one another in said holes, and the lower ends of said bars being inwardly turned to form a stationary basket when the sections are brought together.
16. In an incinerator, a combustion chamber having a grate and a filling opening, grate sections depending within said combustion chamber and movable toward and from one another, the upper ends of said grate sections being hinged near the side walls of said combustion chamber and their lower portions being inwardly curved, and the inwardly curved portions of said sections adapted to contact with one another to close the space between them, substantially as described.
17. In an incinerator, a combustion chamber having a grate and a filling opening and a crown wall, a grate composed of sections hinged on said crown wall near the side walls of said combustion chamber and depending within said combustion chamber, and said sections consisting of straight end pipes, and intermediate pipes having inwardly curved lower ends, and cross pipes connecting said end pipes and the inner ends of said inwardly curved pipes, substantially as described.
18. In an incinerator, a horizontal combustion chamber having a grate and top filling openings, a vertical combustion chamber for light material also having a grate and a passage opposite said grate communicating with said combustion chamber, and an auxiliary furnace located between the upper part of said combustion chamber for light material and the filling openings of said combustion chamber and communicating with said combustion chamber and with said combustion chamber for light material, the latter chamber and said auxiliary furnace having top filling openings.
19. In an incinerator, a combustion chamber having filling openings and a crown arch having a gas consuming chamber formed therein communicating with said combustion chamber, a combustion chamber for light material, and an auxiliary furnace having flue openings communicating with said combustion chamber for light material and said gas consuming chamber.
20. In an incinerator, the combination, with a combustion chamber having a lower stationary grate, of a basket grate composed of sections and depending vertically within said combustion chamber and having inwardly curved lower portions that are capable of movement toward or from one another, and a third grate composed of sections arranged to support the material above the lower portion of said second grate.
21. In an incinerator, the combination, with a horizontal combustion chamber and grate, the top of said combustion chamber having filling openings, and hoppers therefor, of a gas consuming chamber located above said combustion chamber, a vertical combustion chamber provided at one end of said horizontal chamber and extending to the top thereof and having a filling opening, a wall being provided between said horizontal and vertical combustion chambers, said wall having a flue opening in its lower portion above the grate in said horizontal combustion chamber and below the grate in said vertical combustion chamber, a wall of said vertical chamber having a filling opening opposite said flue opening and the upper portion of a wall of said vertical combustion chamber having a flue opening therein leading to said gas consuming chamber.
22. In an incinerator, the combination, with a combustion chamber having a stationary grate and a series of filling openings, said chamber having a crown arch and a gas consuming chamber extending lengthwise therein over said combustion chamber, said filling openings extending through said gas consuming chamber, the top of said combustion chamber having flue holes leading into said gas consuming chamber, and a second grate in the form of a basket and composed of sections having inwardly and downwardly inclined lower portions, substantially as described.
23. The combination, with a combustion chamber having a grate and a filling opening, of grate sections depending within said combustion chamber and hinged near the side walls of said chamber, the lower portions of said sections being inwardly and downwardly curved and terminating in pipes extending transversely to those of said sections, there being end pipes connecting the extremities of the inwardly curved portions of said sections with the upper portions of said sections, and said sections being adapted to contact with one another to close the space between them.

24. In an incinerator, the combination, with a combustion chamber, of a grate composed of sections hinged in the upper walls of said chamber and depending therein and
 5 having their lower portions inwardly curved and downwardly inclined to form a basket-like support, said sections being capable of swinging toward one another until their
 10 lower portions are in contact with one another, and of separating a sufficient distance to allow the material to fall between them.

25. In an incinerator, the combination, with a combustion chamber and a stationary fire grate, of a suspended grate composed
 15 of bars depending from the upper walls of said chamber and having inwardly curved lower ends, and bars connecting said inwardly curved lower ends with the upper
 20 portions of said bars, said bars bridging the angle formed by said inwardly curved lower ends and the upper portions of said bars and retaining the material on said inwardly curved ends.

26. In an incinerator, the combination, with a combustion chamber having a filling opening and a fire grate, of a suspended grate located above said fire grate and composed of pipes depending from the upper
 25 portion of said combustion chamber on each side thereof, the lower portions of said pipes being inwardly curved and terminating above the middle portion of said fire grate, the inwardly curved portions of said pipes
 30 on one side of said chamber being spaced apart from the corresponding portions of said pipes on the other side of said chamber, forming a feed opening above the middle portion of said fire grate, pipes extending

transversely of said inwardly curved portions on each side of said chamber and bracing and supporting said inwardly curved portions, and means projecting into the space
 40 beneath said filling opening and above said feed opening and operating to partially support or retard the material falling through
 45 said filling opening, and the lower portions of said depending pipes being curved to direct the material toward said feed opening.

27. The combination, in an incinerator, with a combustion chamber having a fire
 50 grate, of a hanging grate arranged above said grate and formed of a series of vertical pipes depending on each side of the middle portion of said chamber, a space being
 55 formed between the inwardly turned ends of the pipes on opposite sides of said chamber, forming a feed opening through which material may fall upon said fire grate, said pipe ends terminating above the middle
 60 portion of said fire grate, and their lower portions being downwardly and inwardly inclined to direct the material toward said feed opening, and transverse circulating pipes on substantially the same level connecting the ends of said inwardly extending
 65 pipes on the same side of said chamber and supporting the said ends against displacement, substantially as described.

In witness whereof, we have hereunto set our hands this 2d day of February, 1909. 70

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