

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

APPLICATION FILED AUG. 23, 1909.

Patented Jan. 26, 1915.

3 SHEETS—SHEET 1.

1,125,976.

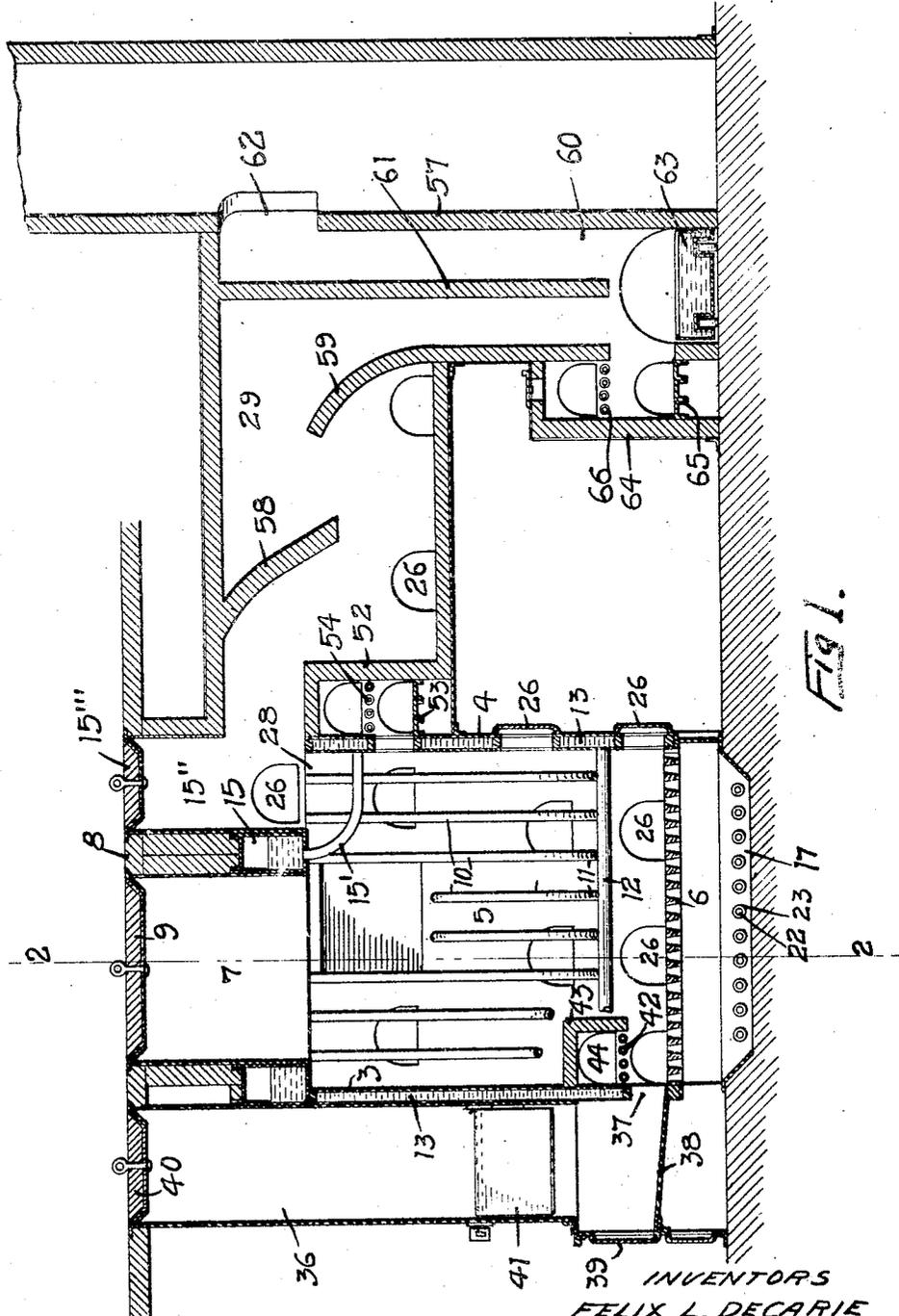


FIG. 1.

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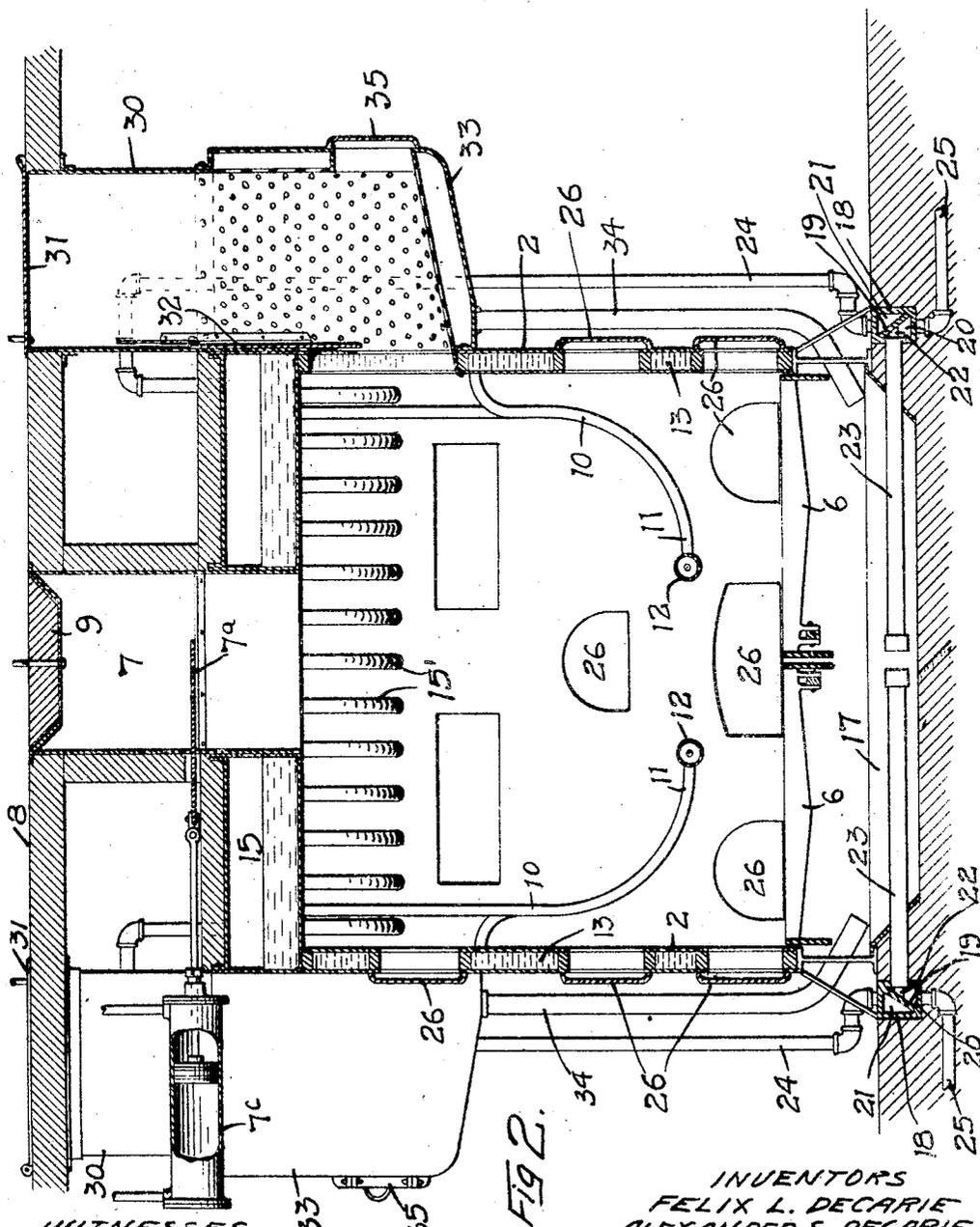


FIG. 2.

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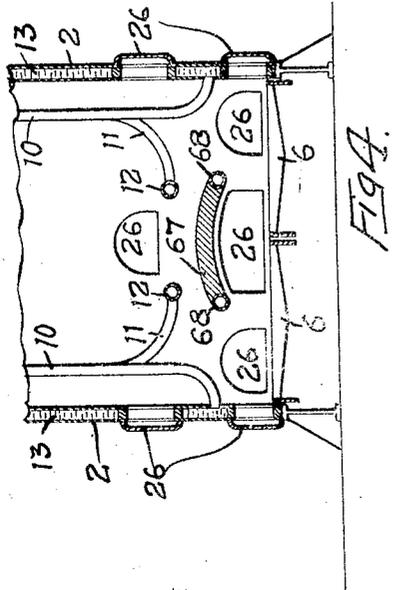


FIG. 4.

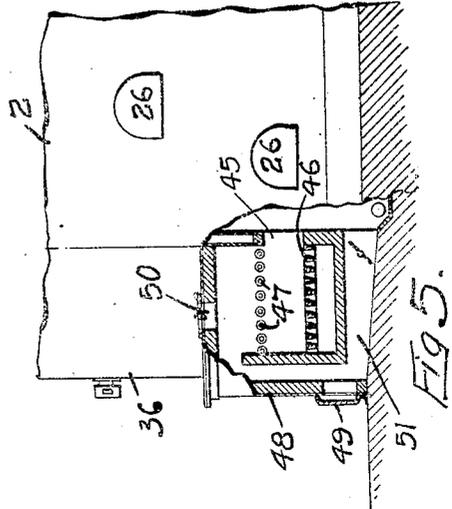


FIG. 5.

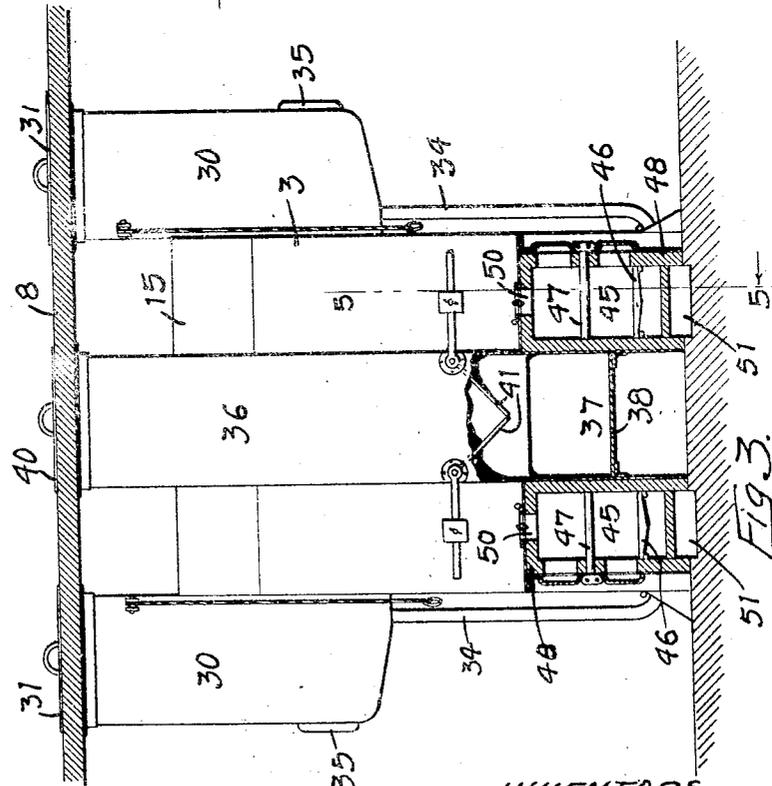


FIG. 3.

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1,125,976.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that we, FELIX L. DECARIE, LOUIS A. R. DECARIE, and ALEXANDER S. 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 having a large capacity and capable of extremely economical operation.

A further object is to provide means for dividing the mass of material to be consumed, so that the flames can penetrate and work through the material in the combustion chamber more rapidly and perfectly consume the same.

A further object is to provide an overhead grate arranged within the furnace and above the main grate, on which large objects, such as a carcass of a dead animal can be placed and held while being consumed by the flames from the fire on the main grate.

Other objects of the invention will appear from the following detailed description, taken in connection with the accompanying drawings, of which—

Figure 1 is a longitudinal vertical section of an incinerator embodying our invention, Fig. 2 is a transverse vertical section of the same, the section being taken on the line 2—2 of Fig. 1, Fig. 3 is a front elevation, showing a modified arrangement of the supplementary or auxiliary grates, Fig. 4 is a detailed section, showing a modified arrangement of the grate, Fig. 5 is a sectional detail view of the modification illustrated in Fig. 3, taken on the line 5—5 of said figure.

In the drawing, 2 represents the side walls of the incinerator, preferably formed of steel, and 3 and 4 the front and rear walls respectively. Inclosed by these walls is a combustion chamber 5 having a grate 6 arranged in its lower part. The grate 6 may be of any ordinary or suitable construction and it is adapted to support the fuel, such as coal or wood, that may be used for starting the combustion in the incinerator.

7 represents a hopper leading to the combustion chamber, preferably from a roadway 8, in which a cover 9 is set for closing the open, upper end of the hopper. The material is discharged into the combustion chamber through this hopper in the usual way. Any desired number of these hoppers

may be employed and we may provide the hopper with a slide or cut-off 7^a, which is adapted to be operated by a steam cylinder 7^b, having a suitable piston arranged to reciprocate therein, said piston being connected by a suitable piston rod with the slide 7^a (see Fig. 2). By means of this slide, we are able to control the delivery of the material into the combustion chamber, allowing it to remain in the hopper for any length of time, and finally discharging it therefrom upon the hanging grate by opening the slide 7^a.

When material is dumped directly upon the lower grate of the combustion chamber, it frequently will pack down in such a mass that it is difficult for the fire to penetrate and reach all the material to be consumed and a longer time is required for combustion. To obviate this objection, we provide what we term "a suspended" or "hanging grate", consisting of pipes 10 supported in the upper part of the combustion chamber and extending downwardly therein and having inwardly curved ends 11, which are connected with horizontal pipes 12. These pipes are spaced apart and cooperate with the inwardly curved portions 11 of the pipes 10 to support the material in the combustion chamber and suspend it in such a way over the fire beneath that combustion will be hastened and any wet material will be thoroughly dried by being exposed to the hot gases and flames from the material on the lower grate. The lower portions of the hanging grate sections are inwardly inclined, as shown in Fig. 2, and direct the material deposited thereon toward the center of the combustion chamber, where a space is provided between the pipes 12 to allow the discharge of the material between them onto the lower grate. Between the depending sections of this hanging grate and the walls of the combustion chamber, a flue is formed which allows the products of combustion to circulate around the hanging grate and thereby facilitate the drying of the material on the grate. The inwardly inclined arrangement of the grate sections will cause the material to work itself toward the center and the discharge opening, and the wet material on the hanging grate will act as a baffle and retard the passage of the products of combustion to the outer flue. The walls of the incinerator, as shown, are double, hav-

ing inner and outer casings with chambers 13 formed between them. Through these chambers water circulates around the combustion chamber. A part of the pipes 10 are preferably connected to the chambers 13 and a part of them are preferably connected to a steam generating chamber 15 arranged above the combustion chamber and containing a supply of water. The chamber 15 incloses the hopper 7 and extends horizontally over the combustion chamber.

At the rear of the combustion chamber and at the upper part thereof, we prefer to arrange what we term "an over head grate" preferably formed of a series of pipes 15' connecting the steam generating chamber 15 and the water chamber 13 surrounding the combustion chamber. The pipes 15' are preferably of curved form and they are arranged beneath a hopper 15'', above which is a door 15''', through which the carcasses of dead animals may be dropped directly on to the said over head grate. This over head grate is located directly in the passage through which the flames and products of combustion must pass from the main combustion chamber into the smoke flue. We have found from practical experience, that where the bodies of dead animals are dropped down into the main combustion chamber upon the grate and rest upon the material therein, there is a tendency to pack the material to be consumed, particularly if it is wet, and seriously delay combustion. All this difficulty is obviated by providing this over head grate in the upper part of the combustion chamber, on which the carcasses of dead animals may be dropped and where they may be held without interfering with the fire on the main grate, until thoroughly consumed.

Below the lower grate 6 is an evaporating pan 17, on each side of which headers 18 are horizontally arranged, each having a longitudinal partition 19 and chambers 20 and 21 therein, connected respectively with pipes 22 and 23, which are concentrically arranged, projecting horizontally from opposite sides of the incinerator toward the middle portion thereof in said evaporating pan 17. The headers 18 are connected by pipes 24 with the steam generating chamber 15, so that a circulation of steam will be established through the headers and through the pipes 22 and 23 and in the pipes 25, which last-named pipes may be utilized to conduct the steam away for heating or power purposes. The liquid, dripping from the mass of material upon the grates above, will be evaporated in the pan 17 by the heat from the headers and pipes and at the same time, the lower portion of the mass above will be dried and rendered more combustible.

The water circulates freely through the

water chambers around the combustion chamber. Doors 26 are provided at intervals, through which access may be had to the combustion chamber, for the purpose of stirring or examining the burning material.

Above the combustion chamber and preferably directly over the over head grate 15' we provide an opening 28 leading to the flue and the gas consuming chamber 29. The arrangement and construction of the flue and gas consuming chamber will be hereinafter described.

It sometimes happens that material brought to the incinerator for consumption, is very wet, and in this case, it is desirable to drain out as much of the water as possible before putting the material on to the hanging grate. For this purpose we have shown and prefer to use one or more side hoppers 30. These hoppers are preferably provided with doors 31, arranged in the road way 8 on a level with the door 9 of the principal hopper. The hoppers 30 are located preferably one at each side of the combustion chamber, to which each hopper is connected by a side opening, which connects the outer side of the combustion chamber and the inner side of the hopper. A sliding door 32 is preferably arranged for closing this opening. The bottom and the lower portions of the side wall of the hopper 30 are preferably perforated and they are surrounded by an outer casing 33, to which is connected a drip pipe 34 that extends downward and has its open lower end above the evaporating pan 17. A door 35 is provided in the outer wall of each hopper. When wet material is brought to the incinerator, the door 32 may be closed and this material may be dumped into the hopper 30 and allowed to stand there for any length of time. It can be stirred up by inserting a fork or other tool through the top door or through the door 35. The water that drains off from this material will pass down through the pipe 34 and fall into the evaporating pan 17. When this material is sufficiently dry, the door 32 is opened, the door 35 is also opened and the material is pushed out of the hopper 30 on to the hanging grate. The pipes 10 of the hanging grate opposite the opening in the side hopper, are connected to the water chamber 13 and below the lower edge of said opening, so that the material, as it is pushed out of the hopper, passes over the tops of these pipes and falls on to the hanging grate. The other pipes 10 of the hanging grate are preferably connected to the under side of the steam generating chamber 15, although if preferred, all of the pipes of the hanging grate may be connected to the water chamber 13 and in case the side hoppers 30 are not employed, all of these pipes may be connected to the bottom of the steam generating chamber 15. We

also find from practical experience, that considerable dry material is brought to the incinerator, which does not need to be placed upon the hanging grate, but which can be fed directly to the lower grate 6 and used in starting the fire and in drying the material upon the hanging grate. This material consists largely of paper and similar light, dry substances. For feeding such material directly to the lower grate, we prefer to provide a front hopper 36, which extends from the top of the incinerator to a point just above the lower grate 6. An opening 37 is provided between this hopper and the combustion chamber above the lower grate, and the hopper is also preferably provided with an inclined bottom plate 38 and with a door 39 opposite the opening 37. By opening the door 39, material in the bottom of the hopper 36 may be pushed through the opening 37 on to the lower grate 6.

The upper end of the hopper 36 is preferably on a level with the tops of the other hoppers and this hopper is preferably provided with a door or cover 40. Weighted valves 41 are preferably arranged in the hopper 36 and these valves are arranged to open automatically under the weight of the material in the hopper 36, to permit said material to pass into the lower part of the hopper. These valves prevent any back firing in the hopper 36.

For the purpose of assisting in the combustion of the material upon the hanging grate and of the material that falls from the hanging grate on to the lower grate 6, we prefer to provide one or more auxiliary grates located above or in front of the front part of said grate 6. We have shown in the drawings two arrangements of this auxiliary grate. In Fig. 1 we provide a down draft grate 42, preferably formed of pipes connected to the water circulating system and inclosed by the wall 43 and the front wall of the combustion chamber. A door 44 is provided, by means of which, fuel may be placed upon the grate 42. As here shown, this auxiliary grate is within the combustion chamber and directly over the front part of the grate 6, so that there is from the grate 6 an upwardly extending flame and from the grate 42 a downwardly extending flame. These oppositely extending flames secure practically perfect combustion and produce a very hot fire, which assists very materially in consuming the material supported upon the hanging grate. Instead however, of locating this auxiliary grate within the combustion chamber, we may locate one or more such grates outside the combustion chamber but connected therewith through a suitable opening 45 (see Fig. 5). As here shown, there is an auxiliary lower grate 46 and an auxiliary overhead or down draft grate 47 and these are inclosed within a chamber 48, having preferably a suitable door 49 and a valve opening 50 in the top, through which fuel may be supplied to the upper grate and which may be used for admission of air. We prefer, however, in this instance, to provide a flue 51, extending from the lower part of the main combustion chamber, under and back of the grates 46 and 47, so that the air will be led from the lower part of the main combustion chamber to the space above the down draft grate 47. In Fig. 3 we have shown two of these auxiliary grates, one located on each side of the front hopper. We also prefer to provide an auxiliary furnace, consisting of an upper or down draft grate in connection with the over head grate 15', which, as before stated, is designed especially for consuming the carcasses of dead animals. As here shown, there is an opening in the wall of the combustion chamber, just below the over head grate 15'. A furnace casing 52 is provided in connection with this opening and within it is the lower grate 53 and the upper down draft grate 54. A door is provided in the end of the casing 52 for feeding fuel to these grates. When the device is in use the flames, and products of combustion from the fires on these two grates pass through the opening in the wall of the combustion chamber and into the combustion chamber just below the over head grate 15' and thereby serve to consume the material supported upon said grate 15'. We also prefer to provide a gas consuming chamber 29, which is between the main combustion chamber of the incinerator and the main stack or chimney 57. As here shown, this combustion chamber is provided with the baffles 58 and 59, the baffle 58 preferably extending downward from the top wall and the baffle 59 preferably extending upward from the lower wall and we also provide a vertical flue 60 at the rear end of the gas consuming chamber, which is divided by a partition 61, extending nearly to the lower end of said flue. The connection between the vertical flue and the stack or chimney is preferably made at the point 62, which is at the upper part of said vertical flue. In the lower part of the vertical flue, we preferably provide a suitable water pan 63 and we also prefer to provide in a suitable casing 64 connected to the lower part of said vertical flue, the auxiliary up-draft and down-draft grates 65 and 66. These grates act in the manner already described for the other auxiliary grates and the flames from the fuel upon these two grates meeting the unconsumed gases at the bottom of the vertical flue 60, aid in consuming such gases and hence all of the gases that pass from the main combustion chamber are consumed either in the

gas consuming chamber 29 or in the lower part of the vertical flue 60.

In Fig. 4, we have shown a modification of the hanging grate. As here shown, a part of the pipes 10 are extended downward and upward and have their lower ends connected to the water chamber 13, and in this instance, we prefer to provide a curved arch 67 of suitable material supported upon the water circulating pipe 68 above the lower grate 6 and below the open space between the pipes 10 forming the hanging grate. With this modified construction, the material on the hanging grate, as it falls through the open space between the parts of the grate, rests upon the upper surface of said arch, where it is highly heated and it gradually falls off the edge of this arch; or it may be pushed off by the stoker, who has inserted his stoking tool through one of the doors in the sides of the combustion chamber.

It will be seen that with this construction, we secure a very rapid and economical incineration of all kinds of refuse or garbage material. Ordinarily material is fed directly into the combustion chamber and is held for a time while being dried and then consumed upon the hanging grate. A portion of it falls through the space between the two parts of the grate into the lower or main grate. Very wet material is first placed in one of the side hoppers where the water is drained off of it in the manner already described. Dry, inflammable material, such as paper, etc., is fed through the front hopper and is used for starting or feeding the fire upon the lower grate. The bodies of dead animals, instead of being thrown directly onto the fire of the main combustion chamber, as has been the custom prior to our invention, are dropped into the over head grate where they are consumed by the flames from the main combustion chamber augmented by those from the auxiliary furnace, located in the rear and below said over head grate. The products of combustion pass from the main combustion chamber into the gas consuming chamber and are held therein by means of the baffles until practically all consumed and any residue thereof will be completely consumed by encountering the flames from the auxiliary furnace located at the bottom of the vertical flue.

We do not limit ourselves to the details of construction, as the same may be varied in many particulars, without departing from our invention.

We claim as our invention:—

1. The combination, in an incinerator, with a main combustion chamber having a grate, and an outlet flue for the products of combustion, a front hopper having a flue connection with the lower part

of said main combustion chamber, and an auxiliary furnace located in the lower part of said main combustion chamber and communicating with the passage between said main combustion chamber and said front hopper.

2. The combination, in an incinerator, with a main combustion chamber having a grate and an outlet flue, of a front hopper having a passage in its lower walls communicating with said main combustion chamber above its grate, said front hopper having a grate therein on a level substantially with the grate in said main combustion chamber for feeding material as fuel onto the grate of the main combustion chamber, and an auxiliary furnace arranged in said main combustion chamber above its grate and the passage leading from said front hopper to produce a down-draft at such point, substantially as described.

3. The combination, in an incinerator, with a main combustion chamber having a grate and an outlet opening, and a filling opening located above said outlet opening, of a grate arranged below said outlet opening, and an auxiliary furnace located at one side of said main combustion chamber and communicating with the upper portion thereof and with said outlet opening.

4. The combination, in an incinerator, with a combustion chamber having a suspended grate composed of vertically depending pipes, the lower portions being downwardly and inwardly inclined, a descending flue and a stack communicating with a portion thereof, of a gas consuming chamber leading from said combustion chamber to said descending flue, a downwardly inclined baffle wall arranged to deflect the products of combustion in said gas consuming chamber, and a second baffle wall upwardly inclined and arranged to deflect the products of combustion passing from said gas consuming chamber toward said descending flue.

5. The combination, with a main combustion chamber having a lower grate and a hanging or basket grate above said lower grate, of a front hopper having a passage in its lower walls communicating with the space between the grates in said main combustion chamber, said front hopper also having a fuel support on a level substantially with the lower grate in said main combustion chamber to feed fuel onto the grate of the main combustion chamber, and an auxiliary furnace located at one side of said main combustion chamber above its lower grate and said passage to produce a down-draft at such point, said auxiliary furnace having a grate and a filling opening, substantially as described.

6. The combination, with a main combustion chamber having a grate and a top fill-

