J. B. RICKETTS.

INCINERATOR.

APPLICATION FILED MAR. 22, 1913.

1,137,424.

Patented Apr. 27, 1915.

2 SHEETS—SHEET 1.

Fig. 1.

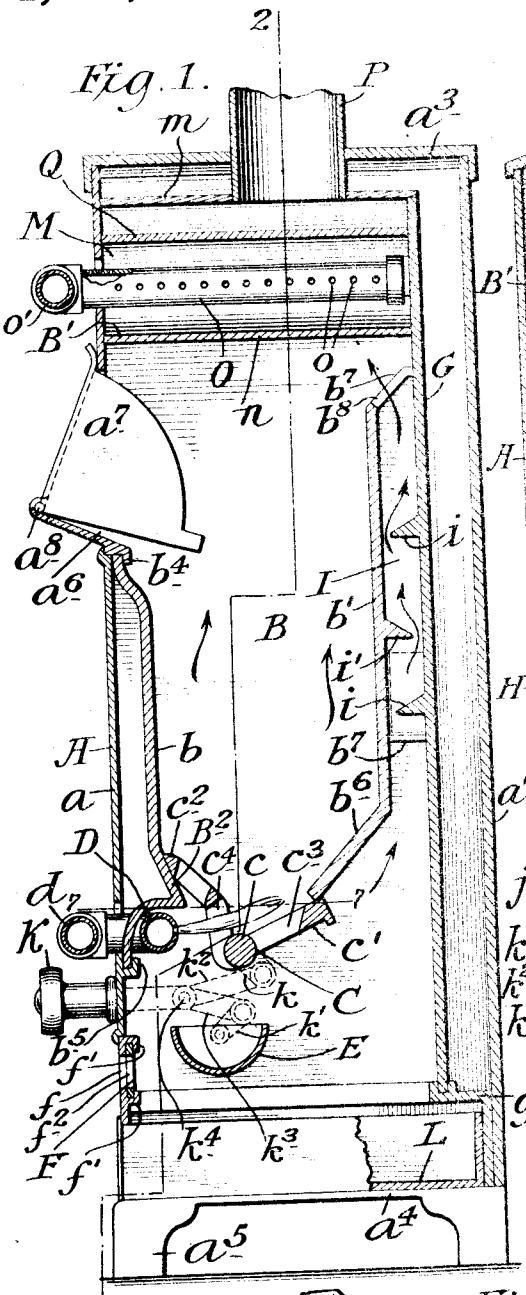


Fig. 2.

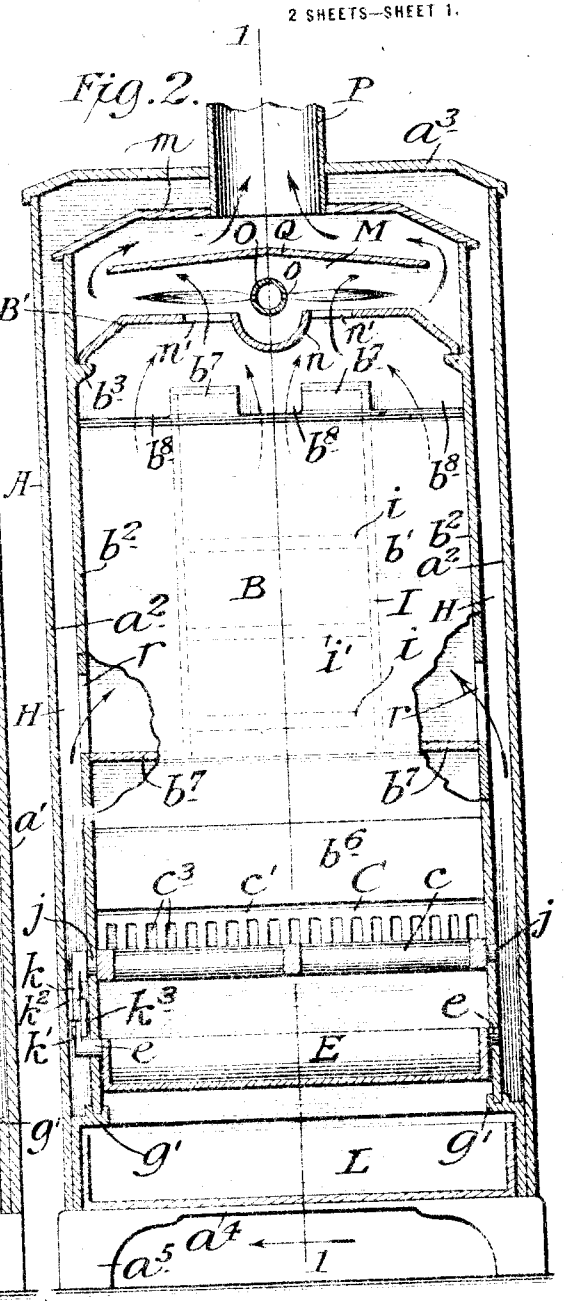
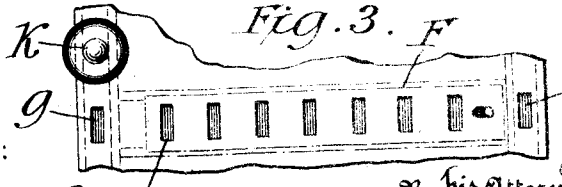


Fig. 3.



Witnesses:

A. R. Appleman

M. C. Rodriguez

Inventor

James B. Ricketts

By his Attorney

Griffin & Brumbaugh

J. B. RICKETTS.

INCINERATOR.

APPLICATION FILED MAR. 22, 1913.

1,137,424.

Patented Apr. 27, 1915.

2 SHEETS—SHEET 2.

Fig. 4.

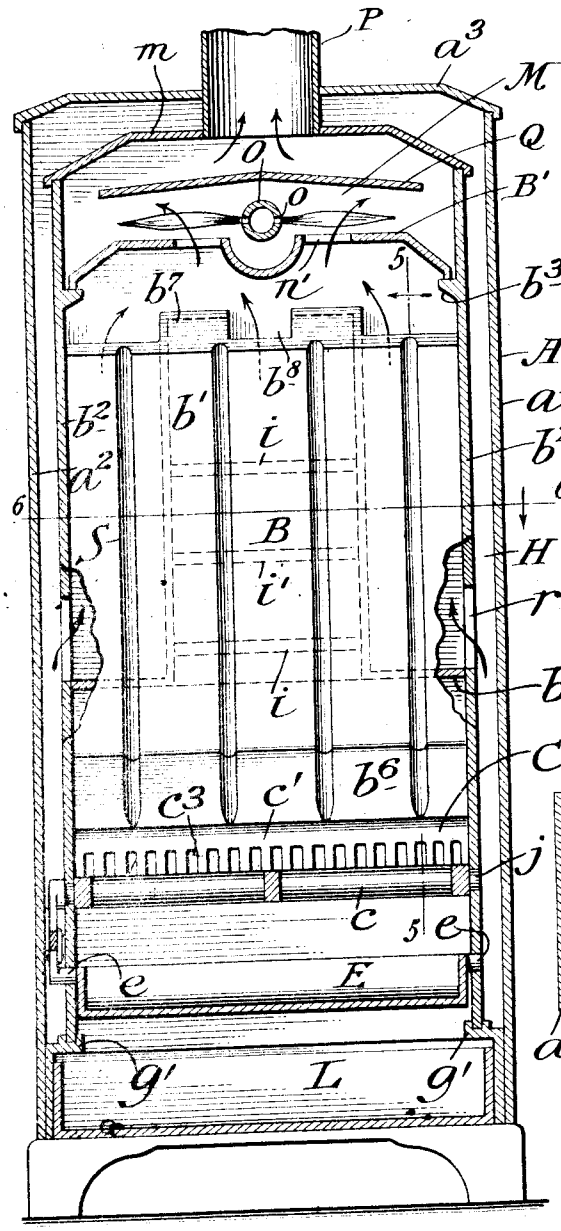


Fig. 5.

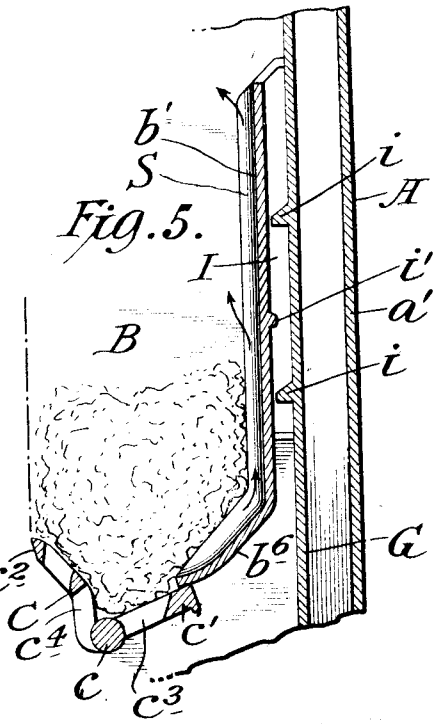


Fig. 6.

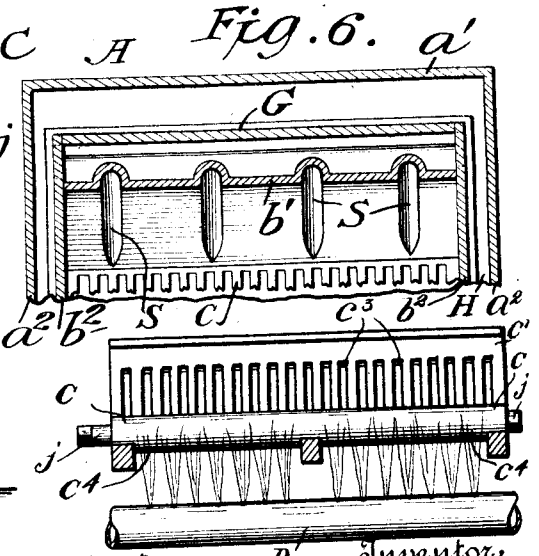


Fig. 7.

Witnesses:

A. R. Appleman

M. C. Rodriguez

Inventor,

James B. Ricketts

By his Attorneys

Griffin & Brumbaugh

UNITED STATES PATENT OFFICE.

JAMES B. RICKETTS, OF NEW YORK, N. Y., ASSIGNOR TO THE NIGHTINGALE COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

INCINERATOR.

1,137,424. Specification of Letters Patent. Patented Apr. 27, 1915.

Application filed March 22, 1913 Serial No. 756,218.

To all whom it may concern:

Be it known that I, JAMES B. RICKETTS, a citizen of the United States, residing at the city of New York, borough of Manhattan, county and State of New York, have invented a certain new and useful Incinerator, of which the following is a specification.

This invention is an incinerator for destroying refuse of various kinds, more particularly for consuming garbage in apartment houses, hotels, dwellings and various other places, although the apparatus is useful in hospitals and sanitoriums for consuming bandages, sputum receptacles, etc.

Among other things, the invertion seeks to rapidly and economically effect the thorough destruction under hygienic conditions of various kinds of refuse; to consume the noxious vapors and odors which arise from the material during the process of incineration; to collect and evaporate any liquid matter which may be present in the material under storage and treatment, and to secure economy in the use of fuel and durability in the different parts of the apparatus.

Practical experience in the use of domestic incinerators shows that the material-supporting element, usually termed the grate, is liable to burn out in a comparatively short time, for the reason that the metal of which it is composed is ordinarily exposed to the direct action of the intense heat from a Bunsen burner. Furthermore, it is desirable in such an apparatus to employ a dumping grate as distinguished from a shaking grate, for the reason that the refuse frequently contains metallic and other non-combustible substances which cannot be destroyed in the relatively short period of time required to consume the refuse, so that the grate, after the destruction of the refuse, may be operated to discharge therefrom such non-combustible matter as well as any small quantity of ashes which may be retained thereon. Accordingly, an important part of this invention is a single pivoted grate which may be rotated to assume a dumping position for discharging the residue thereon, which grate is constructed in a novel manner to permit the flame, more especially from a Bunsen burner, to pass through said grate and without impinging the metal of said grate, whereby the flame is directed to act solely upon the material to be consumed, as a result of which the durability and service of the grate is greatly prolonged.

In a preferred form of the invention, a gas burner is used for supplying the flame and heat necessary to consume the refuse. Said burner is positioned in a manner to be incased partially by an offset forming a part of one wall of the interior refuse hopper and receptacle, whereby the offset and the grate preclude the refuse from lodging upon the burner. The hopper is formed by four walls, two of which have their lower portions inclined toward the single grate, which grate is formed by two upwardly extending wings and said grate is pivotally mounted in such relation to the hopper that said wings will coöperate respectively with the downwardly inclined parts of the hopper walls, thus resulting in a simple and compact organization of parts whereby a single member operates to support the material in the path of the flame, the burner is housed or incased, and the grate is free to discharge the residue therefrom. Below the grate, and coöperating therewith, is a tray toward which is discharged any liquid present in the material upon the grate. Preferably, this tray is pivoted, and it is connected with the grate in a manner to impart a dumping movement to the tray simultaneously with the dumping movement of the grate. It should be stated that the tray turns in one direction, and the grate in an opposite direction, whereby the residue upon the grate is not discharged into the tray when the parts are rocked to dump them. Furthermore, the grate is movable in a direction away from the burner, thus precluding the refuse from the grate from being discharged upon said burner or obstructing the flame openings thereof.

A further feature of the invention is the provision of flues or channels in one wall of the primary chamber, preferably the back wall thereof, which flues or channels serve the twofold purpose of drain gutters for the flow of excessive free liquid from wet garbage, etc., down to the grate, and as updraft flues for the heated gases from the chamber below the grate, so that the heat and gases will be brought into direct contact with the garbage or other refuse present in the primary chamber for the purpose of preliminarily drying such garbage.

Manifestly, the burning of garbage or other refuse, particularly should the matter be in a wet or moist condition, results in producing noxious fumes and gases, but in this apparatus provision is made for burning such gases and fumes by the agency of a secondary burner, preferably a Bunsen burner. The secondary burner is positioned within a chamber, termed a secondary chamber, formed by the crown sheet of the hopper and a baffle plate, said crown sheet having apertures so positioned that the gases will flow through the secondary chamber and the path of the flames emanating from said burner. To support combustion in the secondary chamber, air is admitted thereto from a source independent of the supply to the secondary burner and independent, also, of the gaseous products of combustion. It is preferred to warm the air, and to mix it with gaseous products of combustion as the latter flow from the hopper, so that the mixed gases and air are admitted to the secondary chamber and to the secondary burner.

Other features and advantages of the invention will appear from the following detail description.

In the accompanying drawings, I have illustrated one practical embodiment of the invention, but the construction shown therein is to be understood as illustrative, only, and not as defining the limits of the invention.

Figure 1 is a vertical section taken from front to rear through an incinerator embodying certain features of this invention, the plane of the section being indicated by the dotted line 1—1 of Fig. 2 looking in the direction of the arrow. Fig. 2 is a vertical section at right angles to Fig. 1, or from side to side through the incinerator, and on the dotted line 2—2 of Fig. 1, looking in the direction of the arrow. Fig. 3 is a detail view in front elevation, illustrating the air inlets, the heating flues, and the means for controlling the admission of air to the interior of the incinerator and below the grate. Fig. 4 is a cross section, similar to Fig. 2, looking toward the back wall of the incinerator, showing the channels or flues therein. Fig. 5 is a vertical detail section on the line 5—5 of Fig. 4, illustrating a part of the primary chamber with the refuse therein and showing the manner in which the heat and gases are brought into direct contact with the refuse. Fig. 6 is a horizontal section on the line 6—6 of Fig. 4. Fig. 7 is a horizontal section about on the plane of the dotted line 7—7 of Fig. 1 with the shouldered front plate omitted, illustrating the relation of the burner and the grate.

A designates the outside casing, B the primary combustion chamber which serves the purpose of a storage receptacle or hopper, C the grate, D a primary burner, and E a tray positioned below the burner and the grate and in coöperative relation thereto.

The casing A consists of a front wall a, a back wall a', side walls a^2, a top a^3, and a bottom a^4, said casing being supported in a suitable raised position by feet or legs a^5. The casing is generally rectangular in form, although the shape and dimensions may be varied as desired. The front wall of the casing is provided with a charge opening a^6 which is normally closed by a hopper door a^7 hinged at a^8, whereby the hopper door may be opened for the purpose of introducing the material into the receptacle or hopper B. Furthermore, the front wall of the casing is provided with a series of air inlet slots f, and with other air inlets g, the purpose of which will be presently described. On the inside of the front wall a is provided guide flanges f', said flanges supporting and guiding a slide F having slots f^2 adapted in one position of the slide to register with slots f in the casing. The slide F may be shifted by suitable means to move the slots f^2 out of register with the slots f, thus cutting off the inflow of air below the burner, but, obviously, this slide may be adjusted to other positions for regulating the volume of air admitted to the lower part of the incinerator. Within the casing and parallel to the rear wall a' thereof is a vertical partition G, the same being supported at its lower end in a horizontal flange g' fixed within the lower part of the casing.

The receptacle or hopper consists of a front wall b, a back wall b', side walls b^2, and a crown sheet B', each preferably composed of cast metal. The side walls b^2 are parallel to side walls a^2 of the casing so as to produce intervening ascending air spaces or flues H, and the lower ends of said side walls b^2 are supported on the flange g' fixed within the casing. The side walls b^2 join with vertical partition G and these side walls are provided with an inwardly extending flange b^3 upon which rests the lower edge of crown sheet B'. The front wall b of the hopper or receptacle is joined at its top end to a flange b^4 of the door opening frame or the front wall a of the casing, as shown in Fig. 1, but the lower part of this front wall b is seated within a flange b^5 provided on the inside of wall a below the burner D. An important feature of the invention consists of an offset B^2 provided on the front wall b, said offset extending horizontally across the front part of the apparatus and at the lower part of the heater. The rear wall b' of the hopper or receptacle is inclined at its lower part at b^6, and the offset B^2 of the front wall and the

inclined part b^6 of the rear wall converge downwardly toward each other and toward the grate C, whereby the material or refuse is directed toward the grate, and any liquid matter present in the material is caused to flow toward the grate and thence to the evaporating tray. The rear wall b' is supported by suitable means parallel to the back partition G, distance pieces b^7 being employed to retain the rear wall in spaced relation to the rear partition so as to result in an updraft flue I. Said flue I is open at the lower end so as to communicate with the chamber below the grate, whereas the distance pieces b^7 at the top of rear wall b' are spaced to produce outlets b^8. Within this flue I are baffles i i', the baffles i extending forwardly from the rear partition G, whereas the baffles i' extend rearwardly from the rear wall b', said baffles i' being spaced relative to the baffles i whereby the gaseous products of combustion flowing upwardly through the flue or duct I will strike against the baffles and be directed in a tortuous path.

Grate C is positioned immediately at the opening formed by the inclined parts B^2 b^6 of the front and rear walls b b', respectively, of the receptacle or hopper. Said grate extends across the incinerator, practically from one side wall to the other thereof, the longitudinal axis of the grate being parallel to the plane of the front wall. The grate is shown as consisting of a horizontal bar c and wings c' c^2, said bar and wings being cast in a single piece of metal. The wings c' c^2 of the grate are inclined upwardly from the central bar c and in diverging relation to each other. The wing c' is provided with slots c^3 which form a series of fingers. The other wing c^2 is provided with a flame aperture c^4 and above this aperture c^4 the wing c^2 may be provided with slots similar to the slot c^3, although it is preferred to make this wing c^2 of solid metal. The bar c of the grate is provided with trunnions f which are fitted in openings of the side walls b^2 of the hopper or receptacle, whereby the grate C is pivotally supported for rotary movement at the bottom of the hopper or receptacle. The grate is pivotally supported at a point substantially midway between the inclined portions B^2 b^6 of the hopper, and the diverging members c' c^2 are so related to the inclined sections of the hopper that the free end of the grate wing c' contacts with the lower edge of the inclined portion b^6 of back wall b', whereas the free end of grate wing c^2 contacts with offset B^2 of the front wall b, whereby the grate occupies such relation to the open lower end of the receptacle that said grate will properly support the material present in the hopper. It should be noted that wing c^2 consists of two portions, the inner portion being substantially vertical to the grate bar c when said grate is in the normal position shown in Fig. 1, and in this inner portion of the wing c^2 is formed the flame slot c^4. The inner portion of the wing c^2 occupies such relation to the grate that it does not support the material which is present in the hopper, but the slots c^4 contained in the substantially vertical portion of the grate are in such relation to the burner D that the flame emanating from the burner will pass through the slots c^4 without impinging the metal of the grate, but will act directly on the material which is supported by the grate. The area of the slot c^4 is such that the flame emanating from the burner will pass through the slots in a manner to act directly upon the material and at the same time avoid injury to the grate, thus prolonging the life and durability of the grate.

The burner occupies a horizontal position close to the front wall b and below the offset B^2, said offset operating to substantially house or incase the burner against the lodgment of any material upon the burner, the grate coöperating with the offset B^2 in precluding the material from coming into contact with the burner. The burner is shown as having a row of flame apertures in the same horizontal plane as the flame apertures c^4 in wing c^2 of the grate. This burner may be of the natural or any preferred construction, and is adapted to be supplied with a mixture of air and gas from a pipe d positioned exteriorly to the incinerator. In view of the fact that no novelty is claimed for the burner *per se*, and that suitable forms of gas or vapor burners may be employed in the construction of the apparatus, I have not considered it necessary to more particularly illustrate or describe the burner.

The evaporating tray E is positioned within the incinerator and below the grate and the burner. This evaporating tray is pivotally supported by trunnions e which find their bearings in suitable openings provided in the respective side walls b^2. The tray is shown as occupying a position a little forwardly of the grate bar c, but the inclined wings c' c^2 converge generally in a downward direction toward the tray so that any liquid present in the material will be drained from the grate and toward said evaporating tray. It will be noted that I employ a dumping grate and a dumping tray, and it is preferred to employ a single operating mechanism for imparting dumping movement to the tray and the grate simultaneously. It is desired to call attention to the fact, however, that said operating mechanism turns the grate in one direction, whereas the tray is turned in an opposite direction, whereby the material resting on the grate will be discharged into an

ashpan L without entering the tray; and, furthermore, the grate is turned in a direction away from the burner, as a result of which there is no tendency of the ashes to be discharged upon the burner for obstructing the flame openings thereof. Various forms of operating devices may be used, but, as shown, the grate is provided at one end with a crank-arm k, the tray is provided with a crank-arm k', and to these crank-arms are connected links k^2 k^2, which links are pivoted at k^4 to a spindle K. Said spindle extends through, and is slidably fitted in, an opening provided in the front wall a of casing A so that the spindle is readily accessible from the outside of the apparatus for the purpose of operating the grate and the tray. When the spindle occupies the position of Fig. 1 the grate lies across the bottom of the hopper or receptacle so as to support the material therein and the tray is in a horizontal position below the grate to receive liquid matter therefrom, but by pulling the spindle outwardly the links are operated to pull on the crank-arms k k', whereby the grate and the tray are rocked on their pivots, the grate turning toward the right and away from the burner so as to dump the ashes into the ashpan L, whereas the tray is turned to the left so as to discharge any solid matter which may have lodged upon said tray.

The side walls b^2 of the hopper or receptacle and rear partition G are extended upwardly above the crown sheet B', the space between said walls being closed by a top m which is below the top a^3 of the outer casing. Between the top m and the crown sheet B' is a secondary combustion chamber M into which the gaseous products of combustion from the primary chamber B are adapted to flow, said gaseous products of combustion being mixed with air supplied by flues H, the latter discharging the warm air into the top part of the primary chamber so that the gases or fumes and the air will be mixed and flow into the secondary chamber. The air and gaseous products of combustion are subjected within the secondary chamber to the flame emanating from a secondary burner O, the same being shown as a horizontal tube extending from front to rear through the chamber M. The burner is provided with two series of flame openings o, in the respective sides thereof, and to this burner there is connected a pipe o' positioned outside of the apparatus, which pipe is supplied with air and gas or other fuel. The crown sheet B' is shown as having a depression n and at the respective sides of this depression are apertures n', said apertures n' being below the secondary burner but quite close thereto.

An exit pipe P extends through the top a^3 of the casing and through the top m of the inside casing, the lower end of said pipe being attached to the inside top m, as clearly shown.

Within the secondary chamber is a baffle Q which extends below the exit pipe P and is quite close to the crown sheet B'. As shown, the baffle Q extends in two directions beyond the exit pipe, and the secondary burner O is positioned between the crown sheet and the baffle. The upwardly flowing gaseous products of combustion and the preheated air flow through the apertures n' in the crown sheet and through the flame emanating from the apertures o in the respective sides of burner O, the effect of which is to consume the objectionable odors present in the gaseous products of combustion. The heat and gaseous products of combustion flow in two directions below the baffle Q and thence the gaseous products of combustion flow above the baffle and make their exit through the pipe P.

In the side walls b^2 of the side casing are slots r which establish communication between the flues H and the flue I at the rear of the primary chamber B. The air necessary to support combustion at the secondary burner O within the secondary chamber M takes the following course: The air flows through apertures or slots g near the bottom of the outside casing A into the flues H at the respective sides of the primary chamber. The ascending air flows through the slots r in the side walls b^2 of the primary chamber and thence into the flue I directly at the back of said primary chamber, whereby the ascending air is heated by contact with the walls G I of the flues through which it flows. The air flows out of the flue I through the slots b^8 at the top of primary chamber B so that the air is commingled with the gaseous products of combustion.

A feature of the incinerator consists in channels or flues S in one wall of primary chamber B, preferably the rear wall b' thereof. Any desired number of these channels may be used, four being shown in Figs. 4 and 6. The channels extend lengthwise of back wall b', they are parallel to each other, and spaced at suitable intervals. As shown, the back wall b' is cast with hollow ribs which extend into the rear flue I, thus leaving the front surface of the back wall smooth except where channels S open through said front surface. The channels are quite narrow, and by occupying vertical positions, there is practically no tendency for small particles of garbage, or other refuse, from passing into the channels so as to obstruct the same. The channels extend from the top edge of back wall b', along the inclined lower part b^6 thereof, and to the line of contact between the grate wing c' and the rear wall. Manifestly, any free liquid in the garbage resting in contact with

the back wall, as in Fig. 5, can flow into and through the channels S, thence to the grate wing c', and thence into tray E. When the incinerator is in the act of burning the refuse, some of the heat and gases from the lower part of the chamber, or the chamber below the grate, will flow in an upward direction through the channels S, and thence out at the top of chamber B, so as to commingle with air flowing through the rear flue I. During the upward flow through the channels S, the heat and gases are brought into direct contact with the refuse at the rear of the mass, and thus the mass will be preliminarily dried.

The operation will be apparent from the foregoing description taken in connection with the drawings, but may be summarized as follows:—The garbage or other refuse may be deposited from time to time into the hopper or receptacle B by opening the door a' and dumping the refuse therein. The material rests upon the inclined portion b' of the rear wall, the offset B^2 of the front wall, and upon the grate, and any liquid matter in the material is drained into the evaporating tray, by permitting it to flow along the walls of the chamber and the wings of the grate, some of the liquid escaping through channels S and finally lodging in tray E. When the hopper contains a sufficient quantity of material, the burners D O are lighted by turning on the gas and supplying air thereto. The flame emanating from the burner D flows through the slots c^4 in the wing c^2 of the grate, said flame acting directly upon the material resting upon the grate so as to reduce the same to an ash. The air necessary to support combustion at the primary burner is supplied through the slots f and through the apertures of the slide F. The air to support combustion at the secondary burner is admitted through slots g into flues H and thence through openings r into the flue I, the air being heated as it flows through the flues. The heated air mixes with the gaseous products of combustion, and the commingled air and gases flow through the apertures n' into the secondary chamber and through the flame emanating from the secondary burner O, the air and gases flowing around the baffle Q and finally emerging through pipe P. The liquid contained in the tray E is evaporated by the heat from the primary burner. The material contained in the hopper or receptacle is preliminarily dried, to a certain extent, by the heat and gases flowing through channels S, but the material at the bottom of chamber B is consumed within a comparatively short time by the intense heat and flame of the primary burner, whereas the gaseous products of combustion are burned and deodorized by the flame from the secondary burner O. When the operations of burning the solid matter and evaporating the liquid matter are completed, there may remain some non-combustible substances, such as metal, upon the grate and some unconsumed solid matter may be contained in the evaporating tray, but to discharge this solid matter it is only necessary for the operator to manipulate spindle K so as to turn the grate in a direction away from the burner, the tray being turned in an opposite direction to the grate thereby, dumping the unconsumed matter into the ashpan L. At times the refuse contained in the hopper becomes compacted or solidified to such an extent that the gases resulting from the combustion of the solid matter will not flow freely through the primary chamber B, in which event the gaseous products of combustion emanating from the burning refuse at the bottom of the receptacle are free to flow in rear of the inclined part b^6 at the bottom of back wall b', which gaseous products of combustion then flow upwardly through flue I, at which time the gases are mixed with the air admitted by flues H and apertures r so that the gases are commingled with air and thence flow into the secondary chamber. It is desired to state that during the operation of consuming the refuse, the heat and flame emanating from the burner D will act upon the refuse resting on the grate in a manner to ignite the material and convert the material at the lower part of the hopper into incandescent fuel, which incandescent fuel will act to dry the moist material in the middle and upper part of the hopper, and also ignite and burn the unconsumed material as it is fed downwardly by gravity toward the grate. This results in economy of operation for the reason that the refuse when burned acts as the fuel to consume itself, thus reducing the volume of gas required to consume the garbage or other matter.

Having thus fully described the invention, what I claim as new, and desire to secure by Letters Patent is:

1. In an incinerator, a combustion chamber one of the walls of which is provided with an offset, in combination with a burner having flame apertures positioned to direct the flame beyond said offset, and a grate provided with flame openings the area of which is such that the flame from the burner will pass into direct contact with the material resting upon the grate and without impinging the metal of the grate.

2. In an incinerator, the combination of a combustion chamber the front wall of which is provided with a horizontal offset extending inwardly of the chamber and at the lower part thereof, a burner substantially housed by the offset, and a single dumping grate at the lower end of said chamber and in the horizontal plane of the burner, said grate

having flame openings of such area that the flame emanating from the burner will pass therethrough without impinging the grate.

3. In an incinerator, a combustion chamber the opposite walls of which converge at the lower parts thereof, one of said converging walls being a transverse offset, a burner positioned below said offset, and a single pivoted grate provided with upwardly diverging wings adapted to respectively contact with said diverging walls.

4. In an incinerator, a combustion chamber the opposite walls of which converge at the lower parts thereof, one of said converging walls being a transverse offset, a burner positioned below said offset, and a single pivoted grate provided with upwardly diverging wings adapted to respectively contact with said diverging walls, the wing of said grate nearest the burner having flame openings of such area that the flame emanating from the burner will pass therethrough without impinging the grate.

5. In an incinerator, the combination of a combustion chamber the front and rear walls of which converge at the lower parts thereof, a burner positioned substantially forwardly of the converging part of one wall, and a single grate embodying upwardly extending wings which coöperate with the converging parts of said walls respectively, the wing of said grate nearest the burner having flame openings through which are adapted to pass the flame emanating from the burner so as to act directly upon the material resting upon the grate.

6. In an incinerator, the combination with a combustion chamber and a burner, of a dumping grate, a dumping tray positioned below the grate, and operating means connected to simultaneously turn the grate in one direction and the tray in an opposite direction.

7. In an incinerator, the combination with a combustion chamber and a burner, of a single pivoted grate, a pivoted tray below said grate, and means whereby at one operation the grate is turned in one direction and the tray is turned in an opposite direction.

8. In an incinerator, the combination with a combustion chamber and a burner, of a pivoted tray, a single pivoted grate provided with inclined wings adapted to drain toward the tray the liquid present in the material resting upon said grate, and a slidable operating member connected to the grate and the tray for simultaneously dumping the same in opposite directions.

9. In an incinerator, the combination with a primary chamber, and a secondary chamber in communication with the primary chamber through an opening in the top of said primary chamber, of a deflector positioned within the secondary chamber and in the path of the gaseous products of combustion as they flow from one chamber into the other, a plate in coöperative relation to the deflector and forming therewith a chamber open for the flow of gases therethrough, and a secondary burner positioned in the chamber formed by and between said coöperating deflector and plate.

10. In an incinerator, the combination with a primary chamber, and a secondary chamber in communication with the primary chamber through an opening in the top of said primary chamber, of a deflector positioned within the secondary chamber and in the path of the gaseous products of combustion as they flow from one chamber into the other, a plate in coöperative relation to the deflector and forming therewith a chamber open for the flow of gases therethrough, means for supplying atmospheric air to the gaseous products of combustion as they flow from the primary chamber into the secondary chamber, and a secondary burner positioned within the chamber formed by the coöperating deflector and plate, said secondary burner having an air inlet which is independent of said means for supplying air to the gaseous products of combustion.

11. An incinerator for the reception and destruction of matter that can be destroyed by fire having a combustion chamber for the receipt of matter to be destroyed, a fire chamber connected with said combustion chamber, an exit flue, a duct leading from the fire chamber outside of the combustion chamber to a point between the material in the combustion chamber and the exit flue, and a plurality of inclined deflectors in the said duct.

12. In an incinerator, the combination with a primary combustion chamber, a secondary chamber into which is adapted to flow the fumes and gases arising from the combustion of refuse matter within the primary chamber, and fuel burning means positioned in a space below the primary chamber, of a vertical flue separate from the primary chamber and forming a by-pass for the fumes and gases when the flow thereof is obstructed by solid matter within the combustion chamber, said vertical flue having its intake below the primary chamber and its outlet positioned above the level of the solid material within the primary chamber, means separate from the space below the burner for feeding air into said vertical flue whereby additional air is mixed with the fumes and gases flowing into the secondary chamber, and means for burning the mixed fumes or gases and the air within the secondary chamber.

13. In an incinerator, the combination with a primary combustion chamber, a secondary chamber into which is adapted to flow the fumes and gases arising from the

combustion of refuse matter within the primary chamber, and fuel burning means positioned in a space below the primary chamber, of a vertical flue separate from the primary chamber and forming a by-pass for the fumes and gases when the flow thereof is obstructed by solid matter within the combustion chamber, said vertical flue having its intake below the primary chamber and its outlet positioned above the level of the solid material within the primary chamber, a gas burner positioned within the secondary chamber, and means separate from the space below the burner for feeding to the vertical flue additional atmospheric air in quantities required to support combustion of the fumes and gases within the secondary chamber, said gas burner having means for feeding air and fuel thereto separate from the air supplied to said vertical flue.

14. In an incinerator, the combination of a primary chamber, a vertical flue having its intake at a point below said chamber and an outlet above the level of the solid material adapted to be contained within said chamber, said vertical flue being separate from the primary chamber and forming a by-pass for the fumes and gases when the solid material within said chamber obstructs the free outflow therefrom of such fumes and gases, a crown sheet to the primary chamber, a baffle positioned above the crown sheet, said crown sheet and baffle producing a secondary chamber and said crown sheet provided with openings for the free outflow of fumes and gases from the primary chamber into the secondary chamber, a burner within the secondary chamber, and means for supplying additional external air to support combustion of the fumes and gases within the secondary chamber.

15. In an incinerator, the combination with a primary chamber, of an upwardly extending flue the intake of which is below the primary chamber and the outlet of which is above the level of the solid material adapted to be contained within said chamber, said flue being separate from said chamber and producing a by-pass for the fumes and gases when the solid material in said chamber obstructs the free outflow of such fumes and gases, a secondary chamber connected with the primary chamber for the fumes and gases to flow therethrough from the primary chamber and said flue, means separate from the space below the primary chamber for feeding additional atmospheric air into the lower part of said upwardly extending flue whereby the air so admitted mixes with the fumes and gases flowing through the flue, and a burner within the secondary chamber.

16. In an incinerator, the combination with a primary chamber, and a burner, of a pivoted grate, a pivoted tray below the burner, and means for imparting movement to the grate and the tray so as to dump the material on the grate away from the burner and to empty material contained in the tray in a direction opposite to the turning movement of the grate.

17. In an incinerator, the combination of a primary chamber having an offset, a pivoted grate in substantially the horizontal plane of the burner and operating to discharge any residue in a direction away from the burner and the offset, a pivoted tray positioned below the grate, and means for operating the tray and grate so as to turn the tray in an opposite direction to the grate.

18. In an incinerator, the combination with a combustion chamber, of a grate positioned across the bottom of said chamber and pivoted for dumping movement so as to discharge the residue of solid matter subsequent to incineration, a burner separate from said grate, and a flue plate positioned within the combustion chamber, near one side thereof, and forming a by-pass flue separate from the chamber, the intake of said by-pass flue being at a point below the combustion chamber and the outlet therefrom being above the level of the refuse material within the chamber so as to provide for the upflow of fumes and gases outside of the chamber when the interior thereof is obstructed by the solid material, said flue plate being provided with a plurality of channels or ducts which open through that surface of the plate against which the refuse material is adapted to lodge, said channels or ducts providing for the drainage of free liquid present in the refuse prior to incinerating the solid matter and serving for the free upflow of heat and gases into direct contact with the solid refuse.

19. In an incinerator, the combination with a combustion chamber, of a grate positioned across the bottom of said chamber and pivoted for dumping movement so as to discharge the residue of solid matter subsequent to incineration, a burner separate from said grate, and a flue plate positioned within the combustion chamber, near one side thereof, and forming a by-pass flue separate from the chamber, the intake of said by-pass flue being at a point below the combustion chamber and the outlet therefrom being above the level of the refuse material within the chamber so as to provide for the upflow of fumes and gases outside of the chamber when the interior thereof is obstructed by the solid material, a plurality of channels or ducts which open through that surface of the plate against which the refuse material is adapted to lodge, the lower part of said flue plate being inclined toward the grate for the purpose of draining through the channels and toward the grate the free liquid present in the refuse prior to incineration thereof.

20. In an incinerator, the combination with a primary chamber for containing the material to be consumed, and means positioned in a space below said chamber for burning fuel, of a secondary chamber through which is adapted to flow the gases from said primary chamber, a flue or duct leading from the space below the primary chamber to said secondary chamber, means for supplying atmospheric air to the gases flowing from said primary chamber and the duct into the secondary chamber, and a secondary burner positioned within the secondary chamber so that the gases mixed with air will flow through the flame emanating from said secondary burner.

21. In an incinerator, the combination with a primary chamber for containing the material to be consumed, and means positioned in a space below said chamber for burning fuel, of a secondary chamber through which is adapted to flow the gases from said primary chamber, and a secondary burner positioned within said secondary chamber so that the flame emanating therefrom is in the path of the gases flowing through said secondary chamber, said secondary burner having an air supply independent of the air admitted to the primary chamber or the gases escaping therefrom.

22. In an incinerator, the combination with a primary chamber for containing the material to be consumed, and means positioned in a space below said chamber for burning fuel, of a secondary chamber through which is adapted to flow the gases from said primary chamber, means for supplying atmospheric air to the gases flowing from the primary chamber into and through the secondary chamber, and a secondary burner positioned within the secondary chamber so that the flame emanating from said secondary burner will be in the path of the gases flowing through the secondary chamber, said secondary burner having an air supply independent of the means for supplying atmospheric air to the gases flowing from the primary chamber into the secondary chamber.

23. In an incinerator, the combination with a primary chamber for containing the material to be consumed, and fuel burning means positioned in a space below said chamber, of a secondary chamber through which flows the gases from said primary chamber, means for feeding atmospheric air to the gases flowing from the primary chamber to the secondary chamber, and a secondary burner positioned within the secondary chamber, said secondary burner having means for feeding fuel thereto and an air supply separate from the air feeding means to the outwardly flowing gases, whereby air is mixed with said outwardly flowing gases within the secondary chamber and such mixed air and gases are consumed or burned by the flame emanating from the secondary burner.

24. In an incinerator, the combination with a primary chamber for containing the material to be consumed, and fuel burning means positioned in a space below said chamber, of a secondary chamber positioned over and connected directly with the primary chamber for the upwardly flowing gases to pass from one chamber into and through the other, means for feeding atmospheric air into such upwardly flowing gases so as to be mixed therewith within the secondary chamber, a baffle positioned in the path of the gases flowing from the primary chamber into the secondary chamber, and a gas burner positioned within the secondary chamber, said gas burner being provided with an air supply separate from the air feeding means to the upwardly flowing gases.

25. In an incinerator, the combination with a primary chamber for containing the material to be consumed, and fuel burning means positioned in a space below said chamber, of a secondary chamber through which flows the gases from said primary chamber, means for feeding atmospheric air to the gases flowing from the primary chamber to the secondary chamber, means for preheating the air as it flows to the secondary chamber, whereby warm air is supplied for admixture with the gases within said secondary chamber, and a secondary burner positioned within the secondary chamber, said secondary burner being provided with means for feeding fuel and air thereto separate from the first named fuel burning means.

26. In an incinerator, the combination with a primary chamber for containing the material to be consumed, and a secondary chamber through which the gases from the primary chamber are free to flow, of a gas burner positioned in a space below the primary chamber, a second gas burner positioned within the secondary chamber, said second gas burner having means for feeding air and fuel thereto separately from the air and fuel supply to the first gas burner, and separate means for feeding atmospheric air to the gases flowing from the primary chamber to the secondary chamber, whereby the gases are mixed with air and subjected to the flames of the second gas burner.

27. In an incinerator, the combination with a primary chamber for containing the material to be consumed, and a secondary chamber through which the gases from the primary chamber are free to flow, of a gas burner positioned in a space below the primary chamber, a second gas burner positioned within the secondary chamber, said second gas burner having an air supply independent of the first gas burner, a flue con-

necting the space below the primary chamber with the secondary chamber so as to produce a by-pass for the gases should the primary chamber be obstructed by the material therein, and means for feeding atmospheric air to the gases flowing out of the primary chamber or through said by-pass flue whereby the gases are mixed with the air and are burned within the secondary chamber by the second gas burner.

28. In an incinerator, the combination with a primary chamber for containing the material to be consumed, of a secondary chamber positioned above and connected directly with said primary chamber for the gases to flow directly into and through said secondary chamber, a chambered baffle positioned within the secondary chamber and in the path of the gases flowing into the same, a burner incased by said chambered baffle, said gas burner having means for supplying fuel and air thereto, and means for supplying air to the gases flowing into said secondary chamber.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JAMES B. RICKETTS.

Witnesses:
H. I. BERNHARD,
M. C. RODRIGUEZ.