P. F. DUNDON.

INCINERATING FURNACE.

APPLICATION FILED JUNE 21, 1907.

1,044,868.

Patented Nov. 19, 1912.

4 SHEETS—SHEET 1.

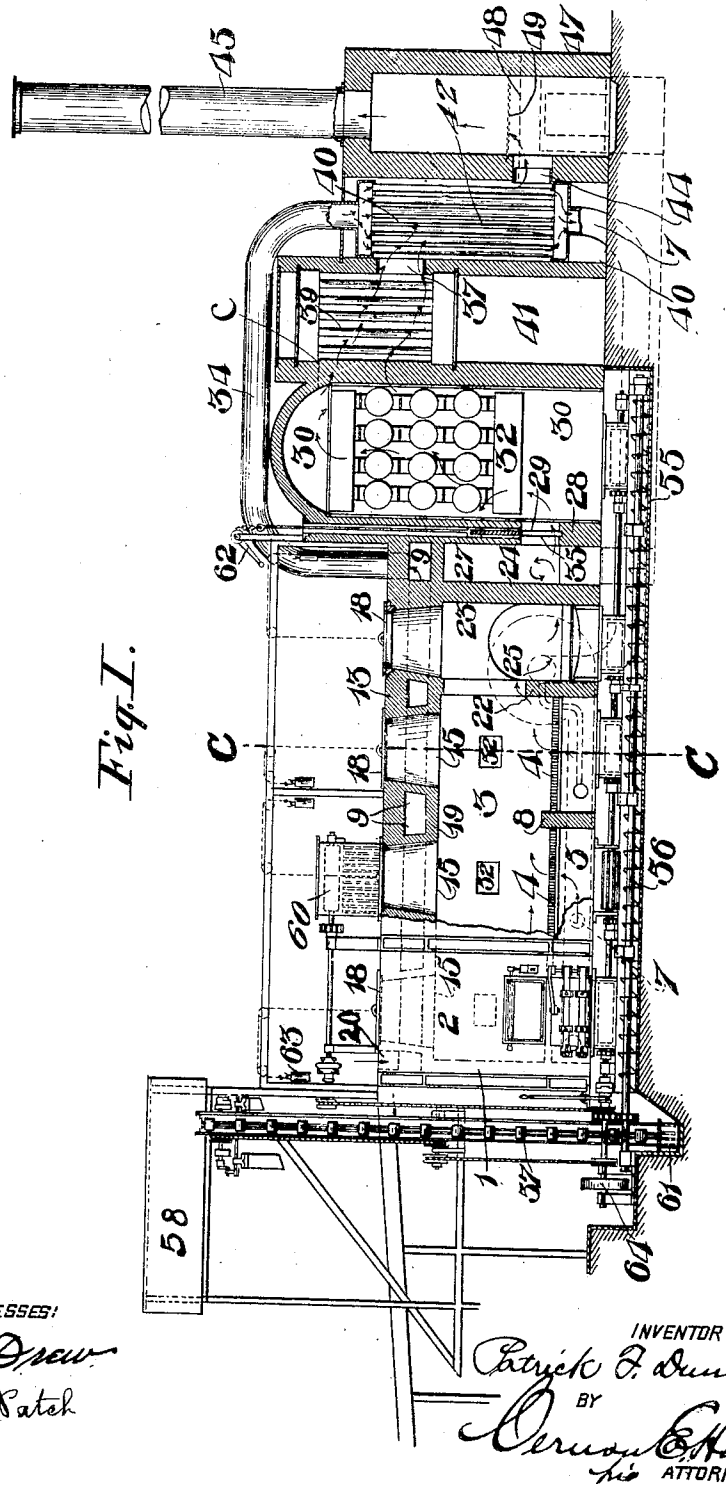

Fig. 1.

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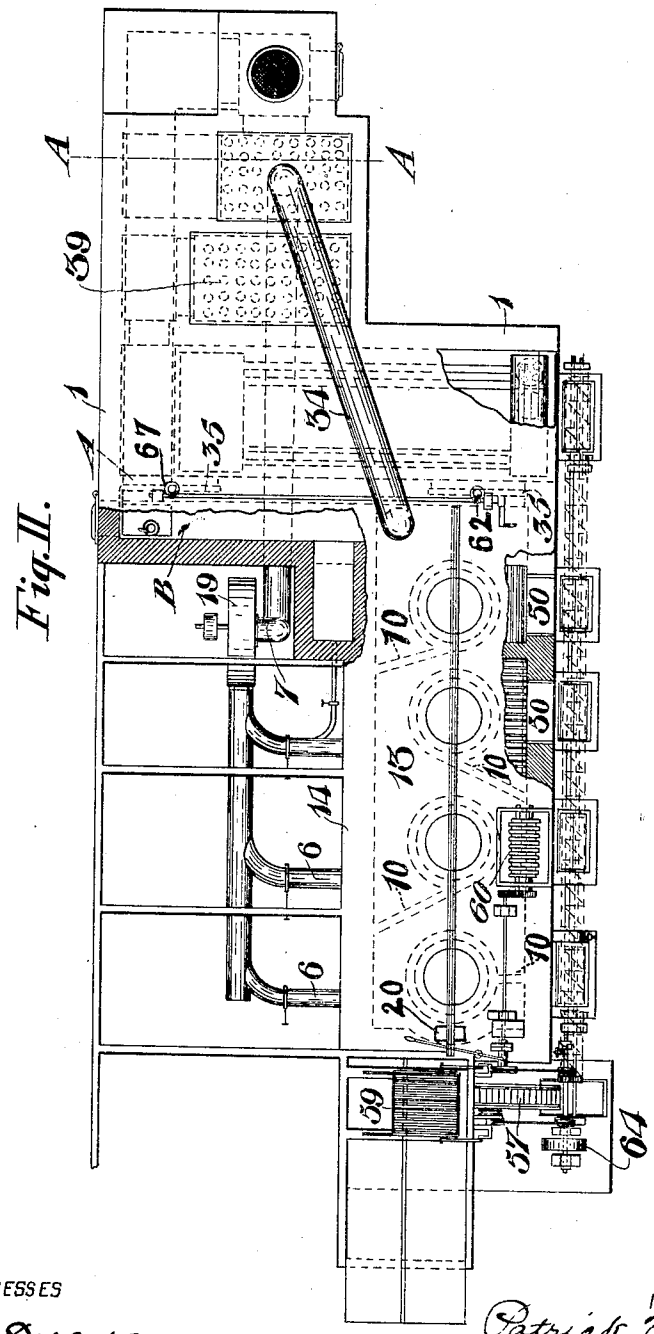
Fig. II.



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4 SHEETS—SHEET 3.

Fig. III.

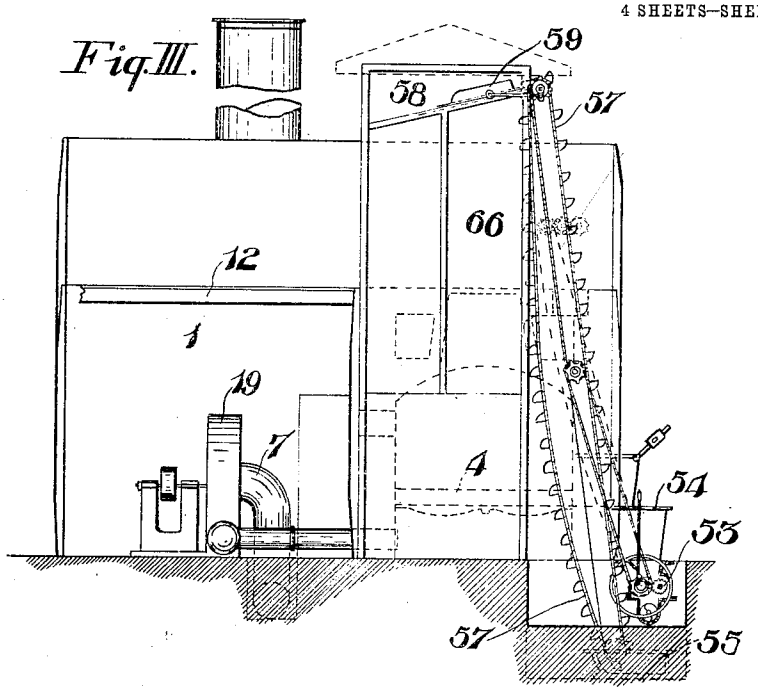
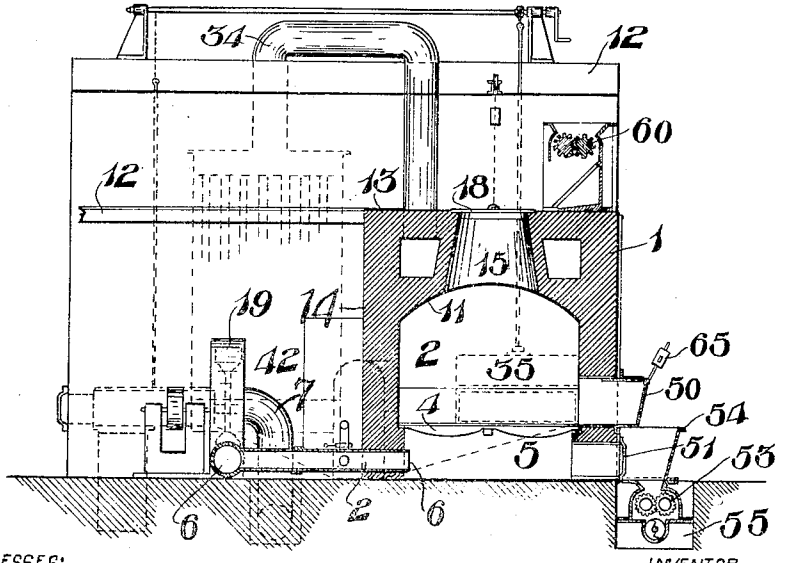


Fig. IV.



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4 SHEETS—SHEET 4.

Fig. VI.

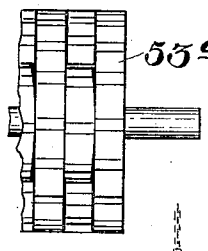


Fig. VII.

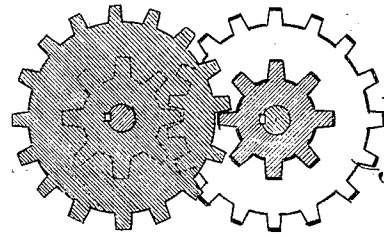


Fig. V.

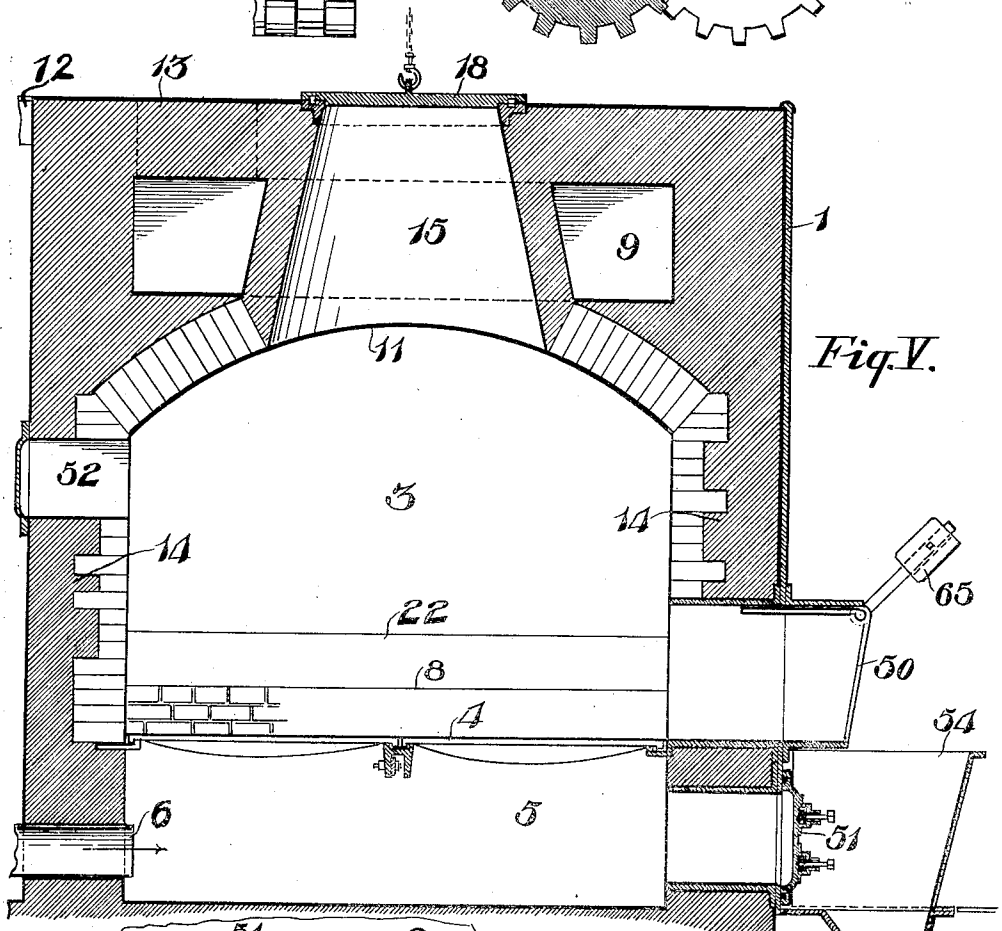


Fig. VIII.

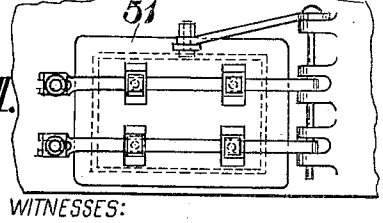
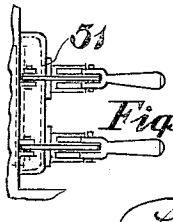


Fig. IX.



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UNITED STATES PATENT OFFICE.

PATRICK F. DUNDON, OF SAN FRANCISCO, CALIFORNIA.

INCINERATING-FURNACE.

1,044,868. Specification of Letters Patent. Patented Nov. 19, 1912.

Application filed June 21, 1907. Serial No. 380,098.

To all whom it may concern:

Be it known that I, PATRICK F. DUNDON, a citizen of the United States, residing at San Francisco, in the county of San Francisco and State of California, have invented certain new and useful Improvements in Incinerating-Furnaces, of which the following is a specification.

This invention relates to an improved incinerating furnace for the destruction of garbage and waste material.

One of the objects is to provide a furnace of the character specified, self-contained in its nature, utilizing the heat generated from combustion to heat air circuitously circulated above the cells of the furnace, and creating in it a powerful forced draft involving the double function first, of removing the odors in the building in which the furnace is housed, thus preventing their escaping therefrom into the outer atmosphere. and discharging the air thus highly heated and rapidly circulated through the grates of the furnace cells, whereby to create a forced draft therein to insure the quick and certain combustion of the garbage and refuse.

Another object is to provide a furnace of such a type and so subdivided that in one chamber where there is an accumulation of heat from the other cells, objects and material such as carcasses of animals may be deposited whereby to insure their cremation.

It has been found in practice with the best furnaces in use, that certain vegetables and fruits, and also animal matter, escape undestroyed and afterward putrefy in the dumps, and it is a further object of my invention to positively avoid and obviate this objection, and to this end I have provided means for macerating into particles such substances as a preliminary to their discharge through the furnace.

My improvements consist in a novel construction, arrangement and combination of parts constituting an organized furnace and apparatus as hereinafter described and illustrated by drawings that form a part of this specification.

Figure 1 is a longitudinal elevation mainly in section of an incinerating furnace constructed according to my invention showing the arrangement and relation of the various parts; Fig. 2 is a plan view of the same furnace with parts broken away; Fig. 3 is an end view of Fig. 1; Fig. 4 is a transverse section on the line C—C in Fig. 1; Fig. 5 is an enlarged transverse section on the same line as Fig. 4, showing details and fire brick lining, which has been omitted in other figures for the sake of distinctness; Fig. 6 is a side view of a modified form of crushing rollers to grind or disintegrate the debris from the incinerating furnace; Fig. 7 is an end view of Fig. 6; Fig. 8 is a front view of one of these sealed doors for closing the incinerating furnace; and Fig. 9 is an edge view of Fig. 8.

Corresponding parts are indicated by the same numerals of reference in the various figures of the drawings.

The complete combustion of garbage presents many different problems, and apparatus for that purpose has passed through a wide range of modification. Some of the elements or parts of such furnaces are common to all, but experiments show that the best results are attained by tentative procedure and observance of the conditions and phenomena of combustion in each case.

To explain my methods and means employed, I will now proceed to describe in a general way the apparatus or plant employed in carrying out my invention with the main features of its construction and manner of operating.

The main body of the furnace 1 is constructed of masonry in the usual manner with all interior surfaces and parts exposed to high temperature protected by a lining of fire brick or other refractory material. The general form is preferably rectangular as shown in the drawing, but circular or other forms may be adopted when the circumstances of erection demand such modification or render it more desirable.

The furnace may be unitary with one primary furnace 2, or the furnaces or cells 3, may be multiple when circumstances demand, such modification being required for want of room and various other reasons that need not be here explained, but the manner of operating remains the same. The division of cells will be in the ash pit only, as all the cells are preferably under one continuous arched roof and have one unobstructed grate surface, but there are separate feed openings on top and doors in front or back for each cell, as well as for each

ash pit, as will be hereinafter more fully set forth, for cleaning out the cells and ash-pits. It may also be mentioned in this connection that there are also doors for dressing charges in the cells, as will be hereinafter described. The several grate surfaces 4 are all arranged at a convenient height above the ground or floor level. The spaces 5, below the grate bars 4, are used for ash pits, they being separated by partition walls 8, one air duct 6 for each unit of grate bars entering from the back of each pt. These partition walls 8 may extend slightly above the grate, to separate the fires in each set if found desirable. The surrounding walls 14 of the furnaces extend above the roof arches to a sufficient height so that an inclosed chamber 9 may be provided upon the top of the arch. On top of these vertically extending walls 14 are placed iron beams 12 of suitable form and size which reinforce the roof of this superposed chamber 9, which may be constructed of arches or tiles of masonry laid between the beams 12. The beams 12 may also serve the purpose of sustaining a floor 13, constructed over the furnace arches. In cases where the material to be burned is supplied from the top, the floor 13 can be extended any desired distance beyond the walls 14, both at the back and front, and of any required size.

In the center of the crown arch of each furnace, a suitable inlet 15 may be provided to permit a supply of the material to be burned to be admitted from the top, which inlets are surrounded by the chamber 9, each having a closing door 18 on top, that when shut will be level with the floor 13. These doors 18 may be moved laterally or vertically to open and close them, and in either case are balanced by counter-weights suspended from above as shown in Fig. 1, and when closed rest on close fitting frames with asbestos or other refractory gaskets, so as to prevent the escape of gases.

Below the roof of the chamber 9, above the furnace arch, there is a series of partitions 10, as indicated by dotted lines only in Fig. 2 for the sake of distinctness, extending from the inside of the floor above to the interior of the arch of the furnace, so that air entering the pipe 34 from the chamber 9 to which it is admitted through the inlet 20, may pursue a circuitous course from one end of the chamber to the other, so as to attain the greatest possible amount of heat in its passage, the partitions attaining this result by forcing the air to travel the longest possible distance through the chamber and to reach all parts of the chamber in its circulation.

The air after being heated in the chamber 9 passes through the by-pass pipe 34 to the chamber 40, which contains a multiplicity of tubes 42. In its course through these tubes it is further heated by the hot gases of combustion which circulate in the chamber and pass through it on their way to the stack or chimney. The pipe 7 then conducts the heated air to the fan 19, which forces it into the separate ash pits 5, by means of the pipes 6, where it creates a strong draft through the grate bars and finally mingles with the gases of combustion. In this way, the air is circulated around and between the tubes of the hot air chamber, where it is heated to a high degree, after which it is discharged into the ash pits as forced draft. When the fan is in operation and this circulation is taking place, great volumes of air are drawn in through the inlet 20 from the building in which the furnace is located, so that the foul odors which are produced by the garbage within the building will be caught and forcibly sent through the fires, keeping the atmosphere within the building pure and free from odors. When more than one incinerating cell 3 is contained in one structure, they are all arranged under one common arch, or constitute one continuous furnace, excepting that each unit of grates may be separated by the partition walls 8 that project above the surface of the grates. In this manner the products of combustion from all of the cells are confined under one arch, and in their passage toward the chimney after leaving the last furnace cell, the products of combustion pass over a bridge wall 22, which separates the incinerating furnaces 3 from the adjoining combustion chamber 23. The chamber 23 is thus at the end of a series of incinerating furnaces and all the products of combustion are obliged to pass through the latter and are accumulated therein before passing away, thus attaining a very high degree of temperature sufficient to destroy all impure gases that have passed from the incinerating furnaces. Means for admitting air to the chamber is provided to produce complete combustion. An excessive degree of heat is obtained in this combustion chamber by concentration therein and accumulation of products of combustion, and consequently it is employed for the disposal of dead animals, and it might also be utilized for other purposes.

Adjoining the chamber 23, opposite the bridge wall 22, there is a solid wall 24 leading to the top of the arch 11, and in the rear at the end of this wall 24 is an arched passage 25 leading into the supplementary chamber 27 between the walls 24 and 28, as shown in Fig. 1. This supplementary chamber is principally intended to prevent changes in temperature of the main combustion chamber 23. By providing a direct opening between the main chamber and this supplementary chamber, the temperature is

always maintained substantially constant, and more surely consumes all noxious gases coming from the furnace cells.

The products of combustion after leaving the chamber 23 pass through the chamber 27 and through the opening 29 into the chamber 30. This chamber, a compartment situated immediately after the vacant space 27 following the bridge wall, may contain any type of steam boiler, but that known as a water tube boiler 32 is preferable because giving a freer passage to the gases of combustion. This boiler is provided with the usual walls to direct the flames and products of combustion and is fitted with the usual accessories, as required. In the first boiler wall 28, besides the arch or opening 29 permitting the products of combustion to pass in and around the boiler 32, there is also a second arch passage A (see Fig. 2), leading to a by-pass pipe B, so that the products of combustion may pass around the chamber 30 through said by-pass pipe without coming in contact with the boiler 32. This change of the course of the gases is controlled by opening and closing the dampers 35.

The object of the chamber 30 is to utilize and apply heat for motive power, preferably by means of a steam boiler as before explained, but other means of utilizing the heat produced may be employed, such as the production of illuminating gases to use as a substitute for expensive fuel. Motive power is thus provided for as a required element in the operation of the furnaces as will appear upon further description.

After the products of combustion have made their passage through the chamber 30, they pass through an opening C, shown in dotted lines in Fig. 1, in the wall of this chamber, the arrows indicating the direction the products of combustion take, and circulate between and around a series of tubes 39 in the chamber 41, which latter constitute a feed water heater. For the purpose of automatically supplying water to this heater and avoiding damage by pressure generated within it, water is preferably supplied by a static head from an elevated tank, of usual form and therefore not shown, with a free passage between the bottom of such tank and the heater. In this manner the heater is at all times kept full of water. The water therefrom is used especially for supplying the steam boiler 32 or can be used for any purpose. After passing through the chamber 41, the hot gases next pass through an opening 37 and traverse the chamber 40, passing around and heating the tubes 38 through which circulates the hot air. From the chamber 40, no further use being made of the gases, they pass at 44 into the chimney 45.

At the base of the chimney 45 is provided a chamber 47, the bottom of which up to the line 48 is filled with water, and in passing through the shallow head of water at the base, the gases of combustion deposit there any light material that may be carried by the draft from the furnaces. The entrance 44 to the base of the chimney is provided with a perforated screen 49 to prevent light material from passing into and out through the chimney. At the front and in the center of each furnace, I provide cleaning doors 50 and 51, as shown in Fig. 5, for the purpose of removing ashes and clinker from each furnace. In the rear and front walls, opposite each set of grate bars, are placed doors 52 for trimming the fires after the garbage is dumped in from above. The doors 51 being subject to air pressure are provided with proper fastenings for sealing them tight. In front of each ash pit door 51, and in chambers properly constructed for the purpose, there are placed pairs of serrated grinding rollers 53 with hoppers 54 above and continuous troughs 55 beneath containing a helical conveyer 56. A slightly modified form of roller is shown at 53ª in Figs. 6 and 7, in which construction some of the gear wheels are idlers. The purpose of these grinding rolls and helical conveyers 56 is that when the fires are cleaned, the ashes and clinkers drawn from the grates will fall into the hoppers 54, in front of the doors, pass between the grinding rolls, and be crushed to suitable size and be conveyed to a receptacle 61 shown in Fig. 1 at the end of the furnaces. Leading down into receptacle 61 is a common bucket conveyer 57 which raises the crushed clinkers and elevates them to a bunker at 58, where the material can be loaded on wagons or cars. As the ashes and clinkers are discharged by the vertical elevator to the bunkers, they fall upon a vibrating screen 59 where the ashes and clinkers are separated in the usual manner and fall down into chutes 66.

Above the incinerating furnaces 2, preferably on the platform 13, I place macerating or grinding rollers 60, as shown in Fig. 4, for the purpose of crushing before burning vegetable or other matter such as will become inclosed in a carbon shell during the process of combustion, and thus resist heat that will consume or disintegrate other substances, and also to crush the water from them. Means to supply and conduct such material to the macerating rollers 60 and the gearing to drive the same, are not shown, they being of obvious construction and depending on the situation of the rollers which can be erected in any suitable place.

The motive gearing and means to impel the same are shown only so far as common use demands, and being well understood,

would, if detailed, only confuse the drawings and render them less clear. These remarks apply to the devices 62 for operating dampers, counterweights 63 to balance doors, driving gearing at 64 where power is applied, counterweights 65 for doors 50, and in other similar cases. The sealed doors shown in Figs. 8 and 9 are not particularly described here because of the subject matter of Letters Patent No. 653,503, granted to me on the 10th day of July, 1900, for sealed doors.

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

1. An incinerating furnace comprising a primary furnace, and a combustion chamber, said furnace and chamber each having a suitable inlet at the top, a hot air chamber, said primary furnace, combustion chamber and hot air chamber in communication with one another, an air heater in the hot air chamber, an inclosed chamber located immediately above the furnace and combustion chamber, and having baffle partitions therein for causing a circuitous passage of air therethrough, and a pipe leading from the inclosed chamber to the hot air heater.

2. An incinerating furnace comprising a primary furnace, a combustion chamber, a supplementary chamber, and a hot air chamber, all in communication with one another, an air heater in the hot air chamber, a superposed inclosed chamber located above the primary furnace, the combustion chamber and the supplementary chamber, means for causing a circuitous passage of air therethrough, and a pipe leading from the inclosed chamber to the air heater.

3. An incinerating furnace comprising a primary furnace and combustion chamber, a boiler chamber, a boiler therein, a feed water chamber, a feed water heater therein, a hot air chamber, an air heater therein and a stack, said chambers in communication with one another, and the products of combustion passing through said chambers, an inclosed chamber superposed above the primary furnace and combustion chamber, a pipe leading therefrom to the air heater, and a pipe returning from the air heater to the grate of the furnace and combustion chamber.

4. An incinerating furnace comprising a primary furnace and combustion chamber, a boiler chamber, a boiler therein, a feed water chamber, a feed water heater therein, a hot air chamber, an air heater therein and a stack, said chambers all in communication with one another, and the products of combustion passing through said chambers, an inclosed chamber superposed above the primary furnace and combustion chamber, a pipe leading therefrom to the air heater, and a pipe returning from the air heater to the grate of the furnace and combustion chamber, and a fan in communication with said pipes for creating a forced feed of said highly heated air.

5. An incinerating furnace comprising a primary furnace and combustion chamber, a boiler chamber, a boiler therein, a feed water chamber, a feed water heater therein, a hot air chamber, an air heater therein and a stack, said chambers in communication with one another, and the products of combustion passing through said chambers, an inclosed chamber superposed above the primary furnace and combustion chamber, a pipe leading therefrom to the air heater, and a pipe returning from the air heater to the grate of the furnace and combustion chamber, the stack having a screen therein, and also a water sink through which the products of combustion pass on their way out of the stack.

6. An incinerating furnace comprising a furnace proper and combustion chamber, both of which have inlets at the top, a supplementary chamber, a water tube boiler chamber, a boiler therein, means of communication between the supplementary chamber and the water tube boiler chamber, and a hot air chamber, an air heater therein, the products of combustion flowing through the boiler and hot air chambers, a stack, an inclosed chamber superposed above the furnace and combustion chamber, a pipe leading from this inclosed chamber to the air heater, a pipe leading from the latter, a fan for circulating the air through said inclosed chamber, pipes, and air heater, and pipes leading from the fan to the grates.

7. In an incinerating furnace, the combination with a combustion chamber, a supplementary chamber, a boiler chamber having a boiler therein, a feed-water heater, an air heater, said chambers and heater communicating with each other, means for shutting off the communication from the supplementary chamber to the boiler chamber, water heater, and air heater, of a chimney, a by-pass leading from the supplementary chamber to the chimney, a pipe for conducting air into the hot air heater and for conducting the heated air to and discharging it beneath the grates of the combustion chamber, and an inclosed chamber superimposed above the combustion chamber from which air is conducted by said pipe to the air heater.

8. In an incinerating furnace, the combination with a combustion chamber, boiler chamber, and boiler therein, and tubular air and water heaters through the tubes of which air and water circulate respectively while the products of combustion from the combustion chamber and boiler chamber circulate around and among the tubes of the

air and water heaters, of an inclosed chamber located over the combustion chamber to receive heat therefrom, a pipe leading from the inclosed chamber to the air heater, and a pipe leading from the air heater.

9. In an incinerating furnace, the combination with a combustion chamber, boiler chamber, and boiler therein, and tubular air and water heaters through the tubes of which air and water circulate respectively while the products of combustion from the combustion chamber and boiler chamber circulate around and among the tubes of the air and water heaters, of an inclosed chamber located over the combustion chamber to receive heat therefrom, a pipe leading from the inclosed chamber to the air heater, and a pipe leading from the air heater to a point below the grates of the combustion chamber.

10. In an incinerating furnace, the combination with a combustion chamber, boiler chamber, and boiler therein, and tubular air and water heaters through the tubes of which air and water circulate respectively, while the products of combustion from the combustion chamber and boiler chamber circulate around and among the tubes of the air and water heaters, of an inclosed chamber located over the combustion chamber to receive heat therefrom, a pipe leading from the inclosed chamber to the air heater, and a pipe leading from the air heater, and a supplementary chamber interposed between the combustion chamber and the boiler chamber, and in communication with both, and means for controlling and changing the course of the gases from the supplementary chamber, either to or around the boiler chamber.

11. In an incinerating furnace, the combination with a primary furnace, a combustion chamber, and an inclosed chamber located thereabove, the latter opening outside of the furnace, of an air heater, the gases from the primary furnace and combustion chamber flowing in contact with the air heater, a pipe leading from the inclosed chamber to the air heater, a pipe leading from the air heater for discharging the heated air beneath the grates, and means for creating a circulation of air through the inclosed chamber, pipes and air heater.

12. In an incinerating furnace, the combination with a primary furnace, a combustion chamber, and an inclosed chamber located thereabove, the latter opening outside the furnace, of an air heater, the gases from the primary furnace and combustion chamber flowing in contact with the air heater, a pipe leading from the inclosed chamber to the air heater, a pipe leading from the air heater for discharging the heated air beneath the grates and means for creating a circulation of air through the inclosed chamber, pipes, and air heater, and a stack into which the products of combustion pass from the air heater, said stack having a screen in the base thereof, to intercept the light fragments and prevent their escape into the atmosphere.

13. In an incinerating furnace, the combination with a primary furnace, a combustion chamber and an inclosed chamber located thereabove, the latter opening outside the furnace, the furnace and combustion chamber having suitable inlets through their crown-arches, and macerating rollers located above one of these openings for the purpose of crushing the material on its way into the furnace, of an air heater, the gases from the primary furnace, and combustion chamber flowing in contact with the air heater, a pipe leading from the inclosed chamber to the air heater, a pipe leading from the air heater for discharging the heated air beneath the grates, and means for creating a circulation of air through the inclosed chamber, pipes and air heater.

14. In an incinerating furnace, the combination with a primary furnace, combustion chamber, and supplementary chamber, all in communication with one another, of a water tube boiler, a feed water heater, an air heater, a stack, the gases from the primary furnace and combustion chamber flowing in contact with the boiler and air heater, an inclosed chamber, a pipe leading therefrom to the air heater, a by-pass leading from the supplementary chamber to the stack, and means for shutting off communication between the supplementary chamber and the boiler, thereby deflecting the heat through the by-pass to the stack, and cutting out the boiler, feed-water and air heaters.

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

PATRICK F. DUNDON.

Witnesses:
A. M. Holland,
Thomas F. Eccles.