No. 658,658. Patented Sept. 25, 1900.

J. F. LESTER & L. A. DEAN.

FURNACE FOR BURNING REFUSE MATERIAL.

(No Model.) (Application filed Feb. 26, 1900.)

3 Sheets—Sheet 1.

FIG. 1.

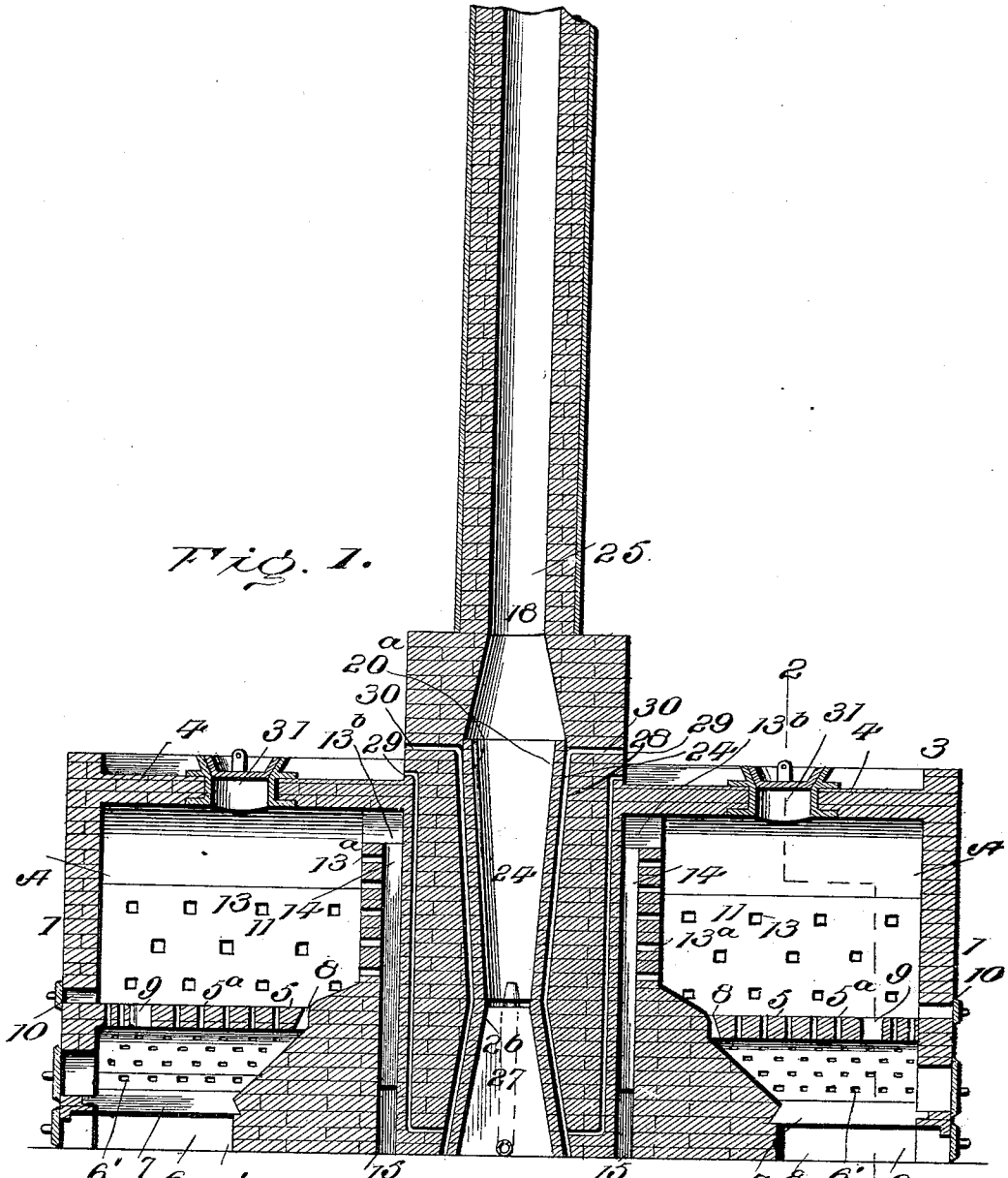
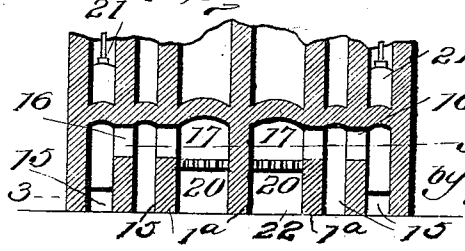


FIG. 4.



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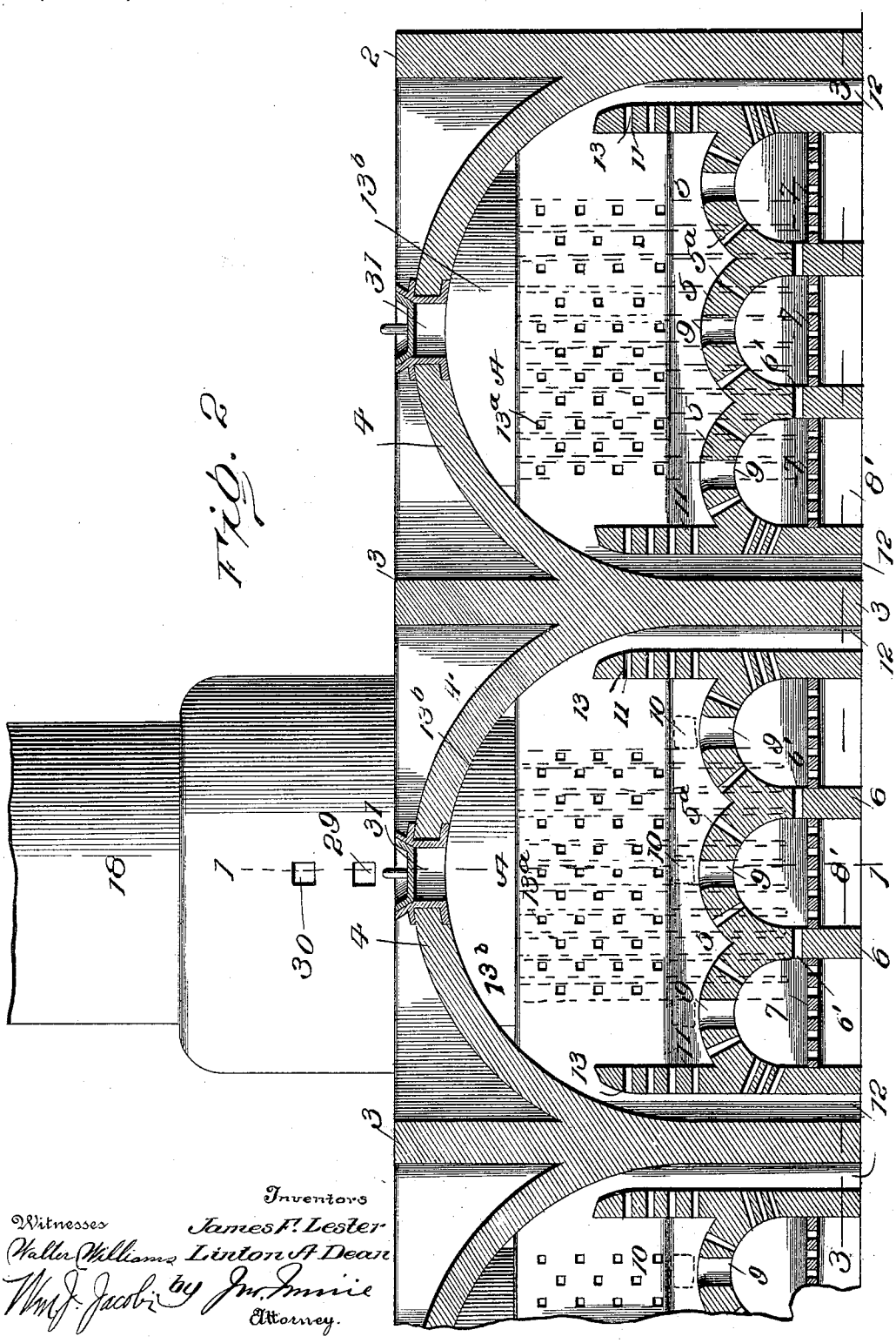
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(No Model.) 3 Sheets—Sheet 2.

Fig. 2.



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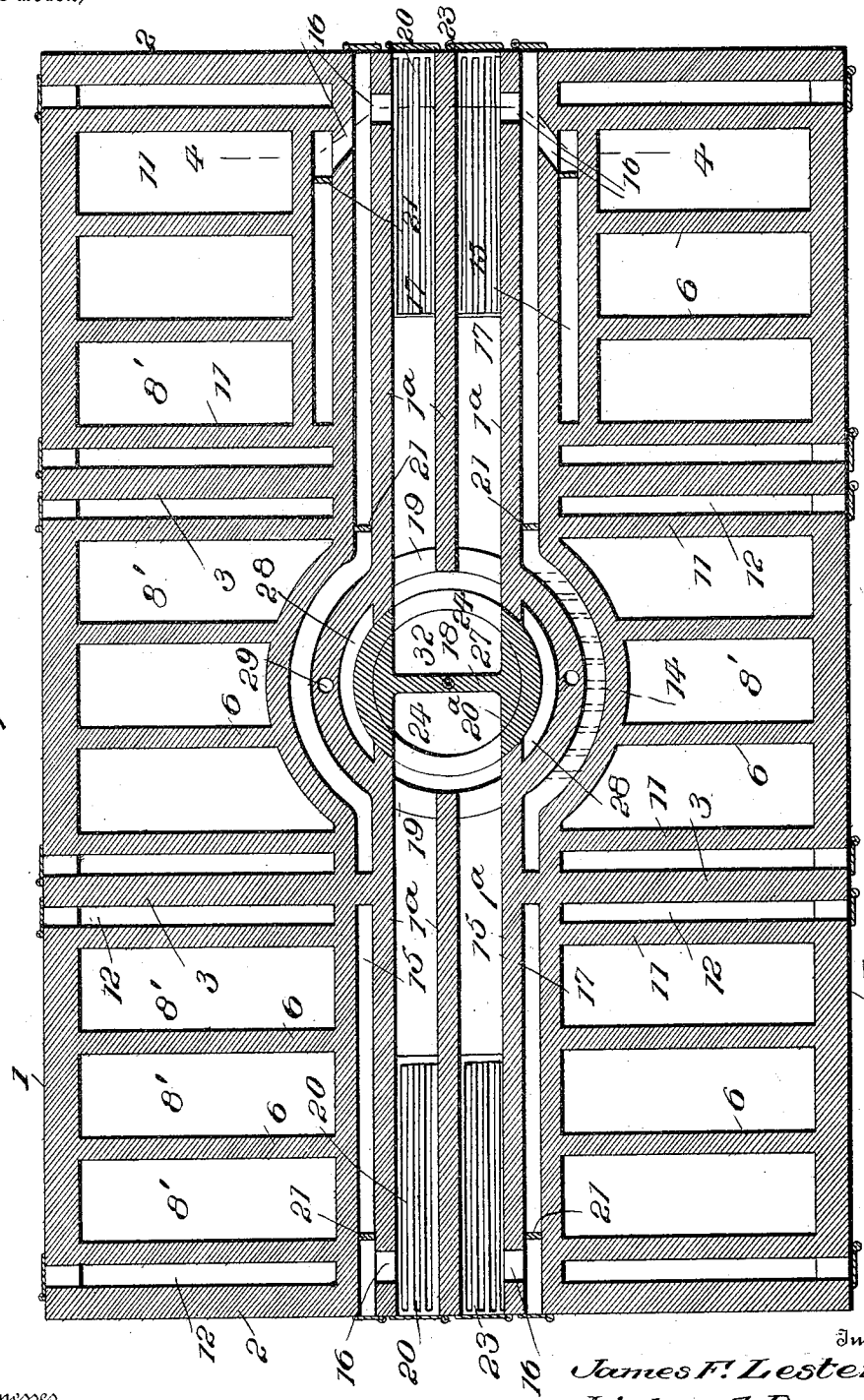


Fig. 3.

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UNITED STATES PATENT OFFICE.

JAMES F. LESTER, OF ATLANTA, AND LINTON A. DEAN, OF ROME, GEORGIA.

FURNACE FOR BURNING REFUSE MATERIAL.

SPECIFICATION forming part of Letters Patent No. 658,658, dated September 25, 1900.

Application filed February 26, 1900. Serial No. 6,614. (No model.)

To all whom it may concern:

Be it known that we, JAMES F. LESTER, residing at Atlanta, Fulton county, and LINTON A. DEAN, residing at Rome, Floyd county, in the State of Georgia, citizens of the United States, have invented new and useful Improvements in Furnaces for Burning Refuse Material, of which the following is a specification.

This invention relates to improvements in furnaces for burning garbage, night-soil, and other refuse material.

One object of this invention is to provide a structure whereby the material to be destroyed can be dumped directly into a preliminary-combustion chamber, where it is dried and partly consumed and a quantity of the gases destroyed, the residue being drawn into a furnace or furnaces below, where it becomes the fuel to maintain the heat of the furnaces.

A further object of this invention is to destroy by fire all the elements of garbage and night-soil by one handling without separation or classification.

A further object of this invention is to provide a structure whereby refuse or other material after it has been subjected to heat is delivered to a series of grates below and utilized as fuel.

A further object of this invention is to provide an economical structure for consuming smoke, the arrangement of the parts enabling all the gases to be efficiently and quickly consumed.

Many other objects and advantages will be hereinafter referred to, and this invention will be particularly pointed out in the claims.

In the drawings, forming a part of this specification, Figure 1 is a central transverse vertical section through the line 1 1 of Fig. 2. Fig. 2 is a longitudinal section on the line 2 2, Fig. 1. Fig. 3 is a horizontal central section on the line 3 3, Fig. 2, to bring out more clearly the arrangement of the flues; and Fig. 4 is a detail transverse section on the line 4 4, Fig. 3.

Referring to the drawings, 1 indicates the side walls of a furnace casing or structure; 1^a, central parallel division-walls; 2, the end walls, and 3 the transverse walls, which divide the casing or structure into separate preliminary-combustion chambers. All these chambers being of substantially the same construction it will therefore be only necessary to describe one. Connecting two of the transverse walls 3 is an arch 4, constituting what we shall term the "receiving" and "preliminary" combustion chamber A. The floor of this chamber is formed of a series of smaller arches 5, each connected to and supported by transverse partitions 6, forming a series of furnaces under each chamber. These furnaces have grate-bars 7, which may be of any suitable and preferred construction, and at the rear ends of said bars the wall of the fire-box extends upward to the respective arched roof and communicates at this point with the combustion-chamber through a hole 8, and under the furnaces are the usual ash-pits 8'.

The arches composing the floor 5 are provided with a number of perforations 5^a, and at a point near the front each arch is formed with an enlarged opening 9, through which the fuel is fed. In the front wall 1 and preferably at a point in line with the openings 9 are rake-holes 10 for the insertion of means for drawing the refuse on the floor of the preliminary-combustion chamber to the openings 9, through which it will fall onto the grate-bars below. Of course it will be understood that the rake-holes, furnace-openings, and the ash-pit openings have suitable closures to be opened at the will of the operator.

The side walls 11 of each series of furnaces are built a short distance from the transverse walls 3 and extend upwardly to a point near the arched roof, forming air-channels 12, each wall 11 having a series of perforations 13, through which and the air-channel 12 the gases may pass when the openings 9 happen to be clogged. The refuse not being assorted it very frequently contains sticks and enlargements, and as this material is dumped into the chamber indiscriminately the openings 9 are likely to become covered. For this reason the transverse partitions 6 have each one or a series of openings 6', forming communication between the several furnaces. Should the opening 9 in either of the side furnaces

become clogged, the heat and gases from such furnace will have an exit through the passage 12 to the enlarged preliminary-combustion chamber, consequently preventing the smoldering of the fires at any one point. The openings 6′, establishing communication between the several furnaces, permit, if necessary, the passage of the products of combustion from one furnace to the other or others.

The rear wall 13′ of the chamber above the arches has a series of restricted exit-perforations 13^a, which latter are arranged on different levels in vertical series, and each series communicate with one of a series of vertical flues 14, the latter opening at their lower ends into a horizontal flue 15. The lowest one of the series of restricted perforations 13^a is in the most direct line to the exit-flue by which the gases are forced to hug more closely the matter in the preliminary-combustion chamber. The wall 13′ extends upwardly in the chamber A to a point near the top of the arched roof 4, leaving an opening 13^b between itself and said roof. This opening opens into the series of vertical flues 14, its object being to provide for the escape of the products in the event that the openings 13^a are clogged. The flues 14 of chamber A open into a flue 15, leading toward the end walls 2, near which they communicate, through openings 16, with parallel flues 17, the latter communicating, through openings 19, directly with the chimney 18.

Interposed in the flues 17 and directly in line with the openings 16 are grate-bars 20, on which coke fires are to be built.

In order that each chamber A might be controlled independently, we provide dampers 21 in the respective flues 15. Thus without interfering with the others we are enabled to cut out one or more of the chambers A for repairs or when not enough refuse is provided to operate a complete plant. Under the flues 17 are ash-pits 22, provided with the usual doors 23, from which the ashes may be removed in any convenient manner.

The lower portion 24 of the chimney 18 is constructed with a lining 20^a, of any suitable refractory material. The chimney below the straight or cylindrical portion 25 is in the form of two truncated cones end to end—that is, the chimney is enlarged at its base and tapers a few feet above the ground to a point 26, from whence it tapers in an opposite direction. The chimney has a division-wall 27, which prevents the drafts in the flues on opposite sides from interfering and causing a deflection of the current. The drafts of the flues on each side enter the respective half of the chimney and do not meet until they have passed above the partition 27.

To prevent the heat from destroying the chimney where it enters from the flues 17, an air-space 28 is formed, preferably, around the refractory material. Air is admitted through flues 29 and passing downward enters the annular space 28 near the bottom of the chimney and becoming heated passes upwardly in the latter and is driven out through openings 30 by the incoming cool air.

The operation of the furnace is substantially as follows: A fire is first started on the grate-bars of each of the furnaces of one or more or all of the chambers A, and then a sufficient amount of refuse is delivered through the openings 31 into the chamber or chambers, falling onto the arches composing the floors. This remains on the floor until it is partially consumed and dried, whereupon a rake or other implement is passed through the rake-hole 10 and a quantity of the dried refuse pulled over to the holes 9, where it is dropped to the fire below. After the building of the first fire in each furnace of a chamber (with any suitable material) the deposited refuse is dried and partially consumed, and thereafter its consumption is accomplished wholly by the combustion created by the refuse itself. The products of combustion pass up principally through the holes 9; but, however, the numerous perforations in the arches enable the lower layer or strata of the material supported on the floor of the chamber to be dried and partially consumed, and as the flames cannot pass up through the solid body of refuse, at least not until the fire has reduced a sufficient quantity of the material, the flames are necessarily directed through the openings 9, consuming the outer layers of the refuse, from whence the products pass through the perforations in the rear wall to the horizontal flues.

The important advantage of our invention resides in the action of the products of combustion on the material to be consumed in each of the chambers. By reason of the relative proportion of the chambers to their furnaces and the manner in which the products pass out at the rear of each chamber through the restricted openings the gases arising from the refuse are retarded and ignited. Owing to the fact that they cannot escape as rapidly as they are created they are necessarily held back and mixed with each other, and by this action they are consequently consumed. However, such gases as may escape are carried along through the horizontal flues 15 and directed through the coke fires, where they are burned. Ordinarily the material deposited in each chamber will assume approximately cone shape. Consequently it will not cover the openings in the rear wall. As the draft will draw the flame to the refuse in the shortest way, it follows that the heat and gases will pass up through the openings 9, following the contour of the pile of material closely to and through the lowest exit-openings to the horizontal flues.

As a strong draft is absolutely necessary to produce the results obtained, we have

found it desirable to construct our chimney in a manner which coacts materially with the rest of the construction toward consuming the refuse. By reason of the double truncated cone or tapering outline of the interior of the stack the velocity of the products of combustion in passing through that portion of the stack is materially increased. Should the draft not be sufficient, an artificial forced draft may be supplied by forcing air through the pipe 32.

When a sufficient amount of oxygen has been admitted through either the rake-hole, furnace-door, or ash-pit as in the judgment of the operator the circumstances may require to evaporate enough of the liquid element of the upper layer of the refuse, a rake is inserted in the rake-hole and the dried portion is drawn over to the hole 9. This operation is continued indefinitely, the operator seeing to it in the meantime that a sufficient supply of refuse material is furnished the combustion-chamber. When the apparatus is used as a smoke-consumer, the smoke may be conducted from any source direct into the combustion-chamber. Its practically-complete combustion may then be secured. The smoke-gases as they are created are prevented from immediately passing out through the exit-flues under the direct influence of the draft by the restricted outlet-perforations. By the arrangement of these perforations smoke is thrown back into the preliminary-combustion chamber and by and with the newly-generated gases a mixing action takes place and the two are ignited before the products pass to the main exit-flues.

We claim as our invention—

1. A refuse-burner comprising a preliminary-combustion chamber having a supply-opening in its top, through which the material is deposited, a furnace communicating with said chamber and having its roof forming a floor in the latter and a wall at the rear of said chamber provided with a series of restricted outlets on different levels.

2. A refuse-burner comprising a preliminary-combustion chamber having a supply-opening in its top through which the material is deposited, a furnace communicating with said chamber, the roof of the furnace forming the floor in the chamber and provided with an opening for the passage of the refuse into the furnace and for the outlet of the products of combustion, and a wall at the rear of the preliminary-combustion chamber provided with a series of restricted outlets on different levels.

3. A refuse-burner comprising a combustion-chamber in which the material is to be deposited, and a series of furnaces below said chamber having arched roofs forming the floor of the combustion-chamber, each of said arched roofs having perforations therein which open into the combustion-chamber.

4. A refuse-burner comprising a preliminary-combustion chamber in which the material is to be deposited, and a series of furnaces below said chamber having arched roofs forming the floor of the preliminary-combustion chamber, each of said arched roofs having an opening therein for passage of the refuse into its respective furnace.

5. A refuse-burner comprising a preliminary-combustion chamber in which the material is to be deposited, and a series of furnaces below said chamber having arched roofs forming the floor of the latter, each of said arched roofs having perforations therein opening into the combustion-chamber and also having an opening therein for the passage of the refuse to its respective furnace.

6. A refuse-burner comprising a preliminary-combustion chamber having a fuel-supply inlet, a series of furnaces below and communicating with said chamber, the tops of the furnaces forming the floor of the latter, said preliminary-combustion chamber having restricted outlets at one end above the furnaces, the fuel-inlet being above the restricted outlets and arranged to deliver the refuse matter in the path of the products of combustion from the furnaces.

7. A refuse-burner comprising a preliminary-combustion chamber having a fuel-supply inlet, a series of furnaces below and communicating with said chamber, the tops of the furnaces forming the floor of the latter, said preliminary-combustion chamber having at one end a series of restricted outlets arranged at different levels, the fuel-inlet being above the restricted outlets and arranged to deliver the refuse matter in the path of the products of combustion from the furnaces.

8. A refuse-burner comprising a combustion-chamber having a fuel-supply inlet, a series of furnaces below said chamber, the tops of the furnaces forming the floor of the latter and having perforations therein opening into the combustion-chamber, one wall of said chamber being provided with restricted outlets arranged at different levels, the fuel-inlet being above the restricted outlets and arranged to deliver the refuse matter in the path of the products of combustion from the furnaces.

9. A refuse-burner comprising a preliminary-combustion chamber having a fuel-supply inlet, a series of intercommunicating furnaces below said chamber, the tops of the furnaces forming the floor of the latter, openings being formed in the top of each furnace for the passage of the refuse into its respective furnace and for the outlet of the products of combustion from the furnaces.

10. A refuse-burner comprising a preliminary-combustion chamber in which the material is to be deposited, a series of furnaces below said chamber having arched roofs forming the floor of such chamber, each roof hav-

ing an opening therein for the passage of the refuse into its respective furnace and for the outlet of the products of combustion from said furnaces.

11. A refuse-burner comprising a preliminary-combustion chamber in which the material is to be deposited, a series of furnaces below said chamber, the tops of the furnaces forming the floor of the latter, a means of communication between the preliminary-combustion chamber and the furnaces, a chimney, a series of vertical flues communicating therewith, said preliminary-combustion chamber being in communication with each of said vertical flues through a series of openings arranged at different levels.

12. A refuse-burner comprising a preliminary-combustion chamber in which material is to be deposited, a series of furnaces below said chamber, the tops of the furnaces forming the floor of the latter, a means of communication between the preliminary-combustion chamber and the furnaces, a chimney, a series of vertical flues, a flue common to said series of vertical flues leading to said chimney, said preliminary-combustion chamber being in communication with each of said vertical flues through a series of openings arranged at different levels.

13. A refuse-burner comprising a casing having a preliminary-combustion chamber, and a series of furnaces below said chamber having arched tops forming the floor of said chamber, said tops having fuel-supply openings near one of the walls of the casing which wall is provided with openings therein in line with said tops, substantially as set forth.

14. A refuse-burner comprising a preliminary-combustion chamber, a series of furnaces under said chamber, the tops of said furnaces forming the floor of the preliminary-combustion chamber, and direct and indirect passages from the furnaces to the chamber, the indirect passages having free communication with the furnaces, substantially as set forth.

15. A refuse-burner comprising a preliminary-combustion chamber, a series of furnaces under said chamber, the tops of said furnaces forming the floor of the latter, and direct and indirect passages from the furnaces to the chamber, the indirect passages having free communication with the furnaces and communicating with the combustion-chamber at different levels, as set forth.

16. A refuse-burner comprising a preliminary-combustion chamber, a series of furnaces below said chamber having communicating openings between said furnaces and air-channels between the side furnaces and the side walls of the chamber, said furnaces having communication with said air-channels, which latter open directly into the combustion-chamber, as set forth.

17. A refuse-burner comprising a preliminary-combustion chamber, a series of furnaces below said chamber, the tops of which are perforated and form the floor of said chamber, a wall at the rear of said furnaces, extending to near the top of the combustion-chamber, a series of outlets in said wall, said outlets being on different levels, a series of flues in rear of said wall extending to near the top thereof and into which said outlets open, a chimney, and a flue common to said series of flues connecting the latter with said chimney.

18. A refuse-burner comprising a preliminary-combustion chamber, a series of furnaces below said chamber, the tops of which furnaces are perforated and form the floor of said chamber, a wall at the rear end of said chamber extending to near the top thereof, a series of vertical flues extending to near the top of said wall, a chimney, a flue common to said vertical flues leading to said chimney, said preliminary-combustion chamber being in communication with each of said vertical flues through a series of openings arranged at different levels.

19. In an apparatus of the class described a preliminary-combustion chamber, having a fuel-inlet, a series of furnaces under the floor of such chamber, a means of communication between the preliminary-combustion chamber and the furnaces, holes being formed in said floor near one end of the chamber for the passage of the refuse into the furnaces and for the outlet of the products of combustion from the latter and the other end of the preliminary-combustion chamber being provided with a series of restricted outlets on different levels, the fuel-inlet being above the restricted outlets and arranged to deliver the refuse matter in the path of the products of combustion from the furnaces, as set forth.

20. In an apparatus of the class described, a preliminary-combustion chamber having a fuel-inlet, a furnace under the floor of such chamber, a hole being formed in said floor at one end of the preliminary-combustion chamber for the passage of the refuse into the furnace and for the outlet of the products of combustion from the latter and a wall at the other end of the preliminary-combustion chamber having a series of restricted outlets arranged on different levels, the fuel-inlet being above the restricted outlets and arranged to deliver the refuse matter in the path of the products of combustion from the furnaces.

21. A refuse-burner comprising a preliminary-combustion chamber in which the material is to be deposited, and a series of furnaces having arched roofs forming the floor in such chamber, said furnaces having a continuous communication with each other, and each furnace communicating with the preliminary-combustion chamber.

22. A refuse-burner comprising a prelimi-

nary-combustion chamber having a supply-opening in its top through which the material is deposited, an exit-flue, a furnace having its roof forming a floor in such chamber, the rear wall of the preliminary-combustion chamber having a series of outlets on different levels, the lowest one of the series of outlets being in the most direct line to said exit-flue.

23. A refuse-burner comprising a preliminary-combustion chamber, a series of furnaces below said chamber, the tops of which are perforated and form the floor of said chamber, a series of vertical flues at the rear of said chamber, a chimney, a flue common to said vertical flues leading to said chimney, and a furnace in the flue common to the vertical flues, said preliminary-combustion chamber being in communication with each of said vertical flues through a series of openings arranged on different levels.

In testimony whereof we have hereunto set our hands in the presence of two subscribing witnesses.

JAMES F. LESTER.
LINTON A. DEAN.

Witnesses:
A. HOLLINGSWORTH,
ALEX G. WEEMS.