

April 8, 1952

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2,592,491

GARBAGE INCINERATING UNIT

Filed Feb. 14, 1948

4 Sheets-Sheet 1

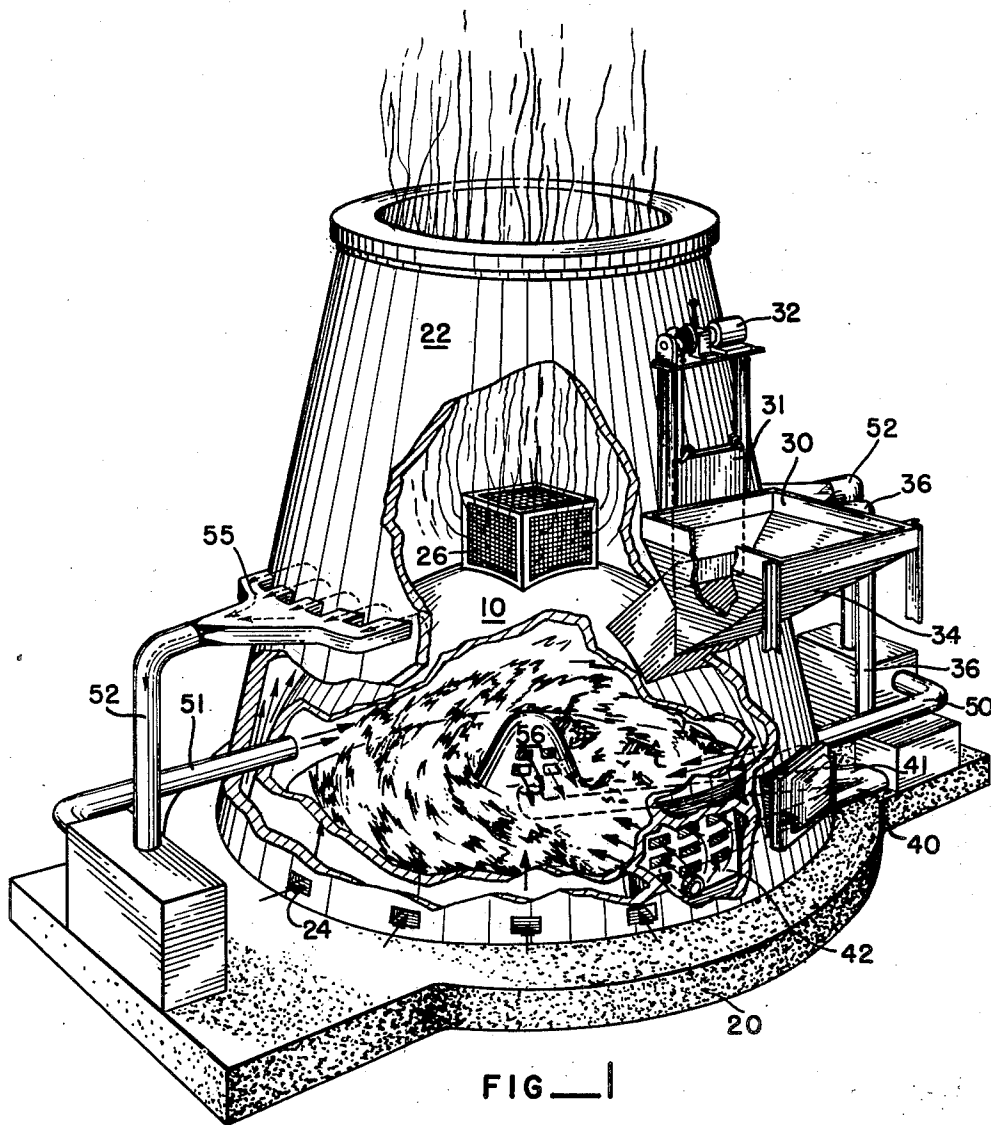


FIG. 1

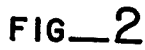
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GARBAGE INCINERATING UNIT

4 Sheets-Sheet 2



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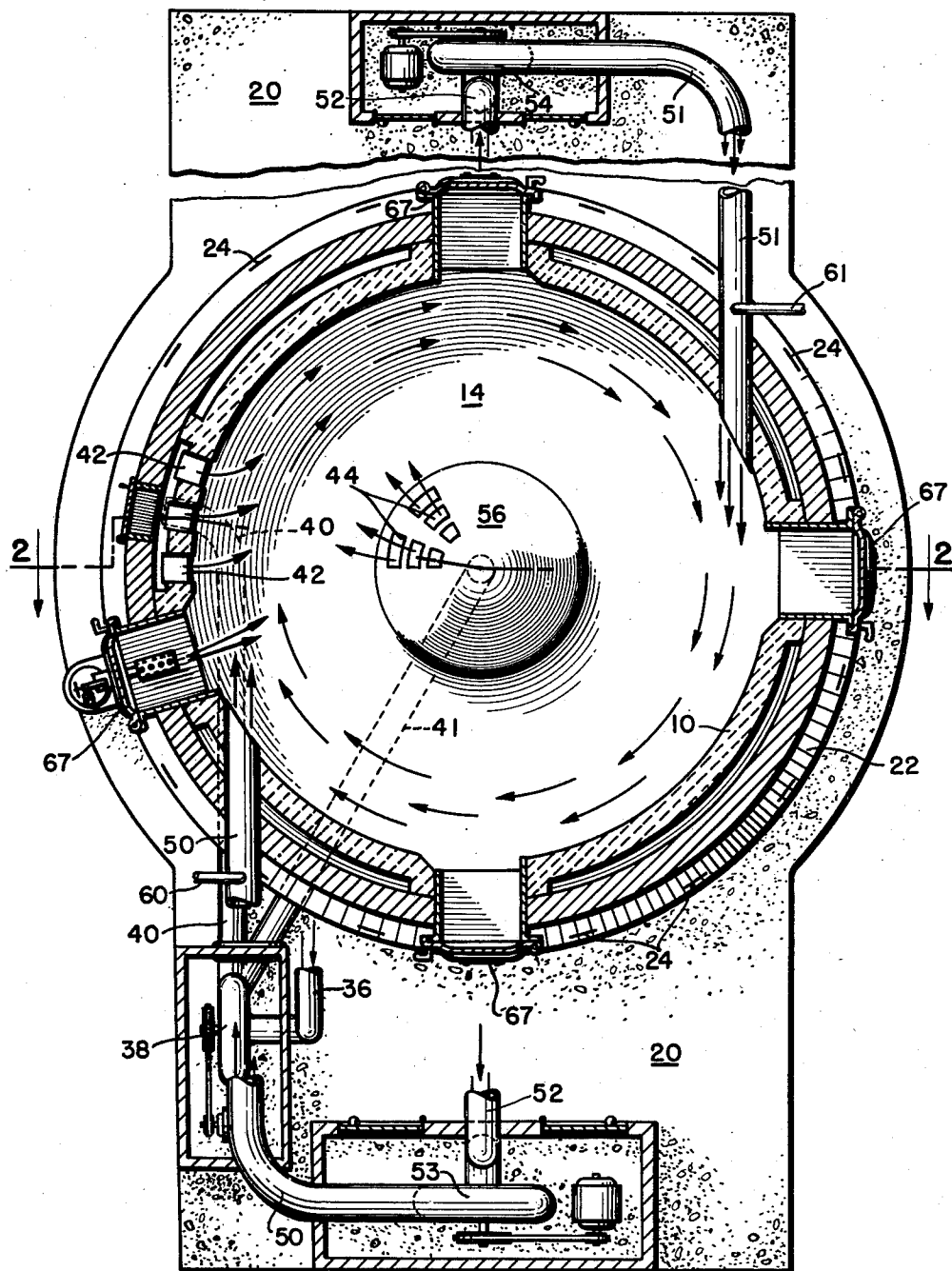


FIG. 3

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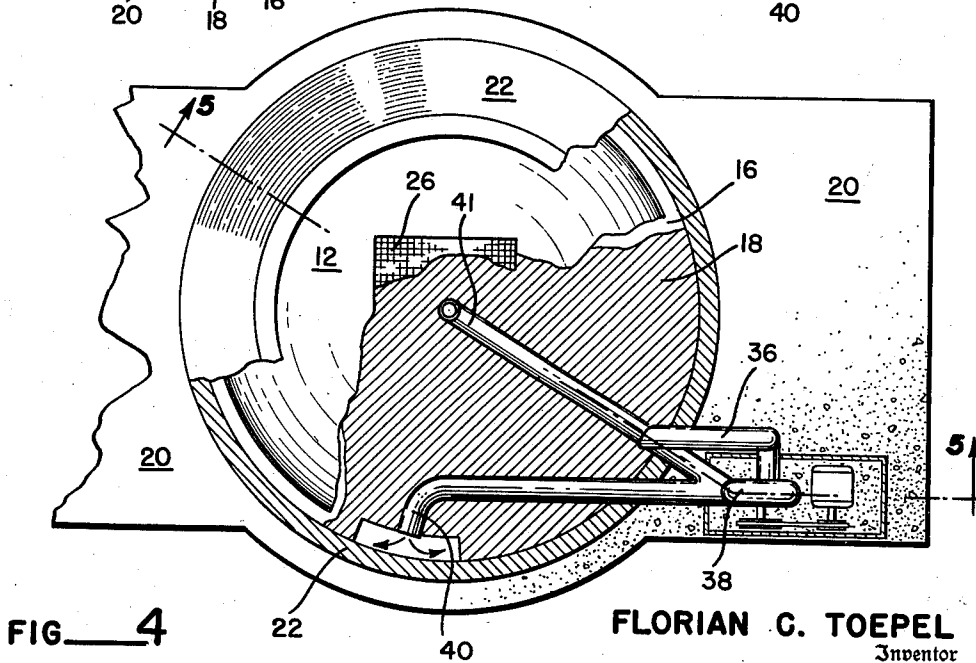
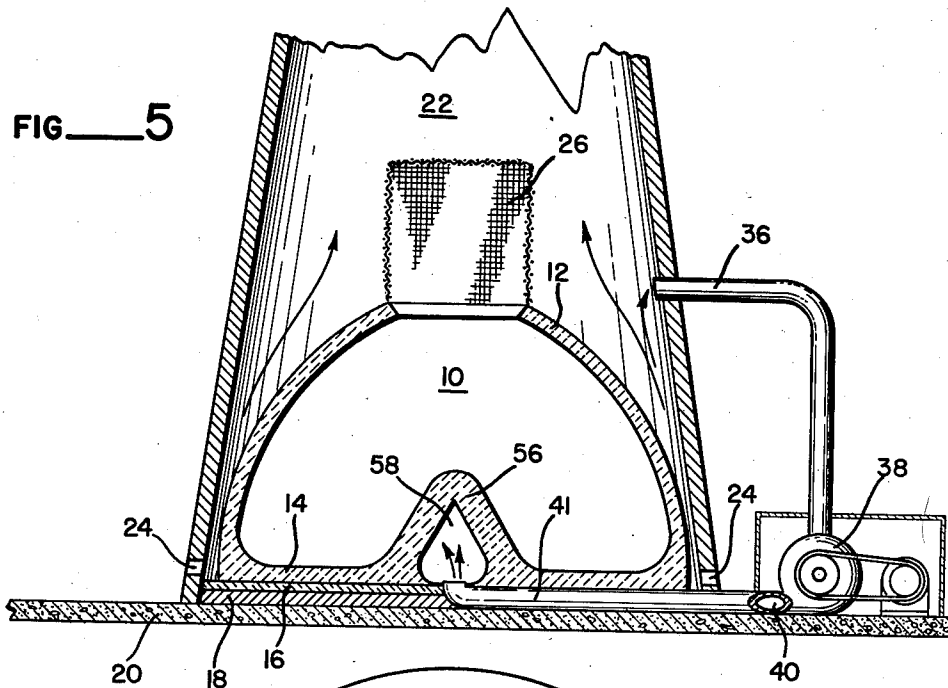
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4 Sheets-Sheet 4



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UNITED STATES PATENT OFFICE

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GARBAGE INCINERATING UNIT

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Application February 14, 1948, Serial No. 8,426

7 Claims. (Cl. 110—8)

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My present invention relates to the general class of the devices referred to as incinerators and, more particularly, an incinerator which, because of its special construction, is particularly adapted as a garbage incinerating unit.

The disposal of garbage in cities has for long been a costly and difficult operation. Normally, it is the usual plan to collect garbage from the various parts of the city and then to haul it, usually by trucks, to outlying districts, where it may be used as fill material, or the garbage may be passed through separation plants where the garbage itself is sorted and graded into different classifications, some of which may be disposed of in sanitary fills, other portions of which may be burned and parts may be salvaged for other purposes. This requires an expensive operation, due to the distance that the material has to be transported and further due to the difficulties of actually disposing of the same. Owing to the public reluctance of having garbage disposal units in centers of population, garbage disposal, as practiced in most communities, is at a point considerably removed from the source and consequently transportation charges are high.

My garbage disposal unit is arranged for economical construction in relatively small units so that they may be widely dispersed throughout a populated area. Further, I have provided a design in my fire chamber which permits of incineration to a degree not possible in those incinerators that have been observed to date.

I have found it possible to produce a high temperature in my unit and consequently, as a result of this high temperature and the particular manner in which I provide for the complete combustion of all volatile materials, it is possible, without meeting any opposition from the residents of a district, to have units of my garbage disposal incinerators placed relatively close to the source of such garbage and thus an overall saving of considerable magnitude is provided.

The principal object of my present invention, therefore, is to provide a garbage disposal unit wherein, by a combination of scientifically planned elements, it is possible to produce maximum efficiency in the rapid destruction or combustion of materials.

A further object of my invention is to provide a garbage disposal unit in which the incinerator chamber is so constructed and so operated as to generate the maximum of volatile gases from the refuse to be destroyed, and to thoroughly con-

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sume these gases so that the discharge from my unit will not be offensive to residents within a close range of the unit.

A further object of my invention is to provide a garbage disposal unit whereby the normal burning of the combustible materials is accelerated and made more complete by the use of blower fans, and other mechanical devices, to the end that the large stacks normally characterizing such devices need not be employed.

A further object of my present invention is to so shape and equip the incinerator of my device that the gas generating properties are most fully developed by the circulation of air and gases in a dome-shaped chamber, which causes these gases to be continuously circulated around an annular fire box until all the combustible gases have been consumed.

A further object of my invention is to provide an incinerating device wherein the process of generating gases and creation of high heat temperatures increases the rapid conversion of solid combustible materials to gas, leaving only a minimum amount of ash and incombustible materials remaining.

A further object of my invention is to provide an incinerator in which the rapid conversion is a basic factor in the design for obtaining high efficiency and high volume of waste destruction, in a minimum amount of time, and in a plant occupying a minimum of space, and without stacks or chimneys which so often betray the presence of such plants.

A further object of my invention is to provide all the means required so that a rotary or swirling action is created within my incinerator which permits the rapid vaporization of all moisture and vapor laden air before it can penetrate the brick lining of the fire box and cause deterioration of the masonry.

Further objects, advantages and capabilities will be apparent from the description and disclosure in the drawings or may be comprehended or are inherent in the device.

In the drawings:

Fig. 1 is a perspective view showing a garbage disposal unit made after the teaching of my present invention, with certain parts thereof being broken away and shown in section to better illustrate the construction.

Fig. 2 is a vertical, sectional view taken through the center of my charging arrangement, and along the line 2—2 of Fig. 3.

Fig. 3 is a horizontal sectional view taken substantially along the line 3—3 of Fig. 2, showing in

plan certain other characteristics which distinguish my garbage disposal unit.

Figure 4 is a fragmentary sectional view, with portions removed to show certain air circulation means;

Figure 5 is a fragmentary view, partly in section, taken generally on line 5—5 of Figure 4.

Referring more particularly to the disclosure in the drawings, the numeral 10 designates the main or primary combustion chamber. This is made as a dome-shaped chamber, much after the plan of a brick kiln, and is provided with the dome proper 12, and a floor 14, which are connected together to form one complete unit, which of necessity must be made of high heat-resistant refractory material. I have found it best to use the special fire brick provided for such purposes, and it is necessary that this combustion chamber be capable of resisting a working temperature of around 3000° F. This is a temperature considerably higher than normally encountered in garbage disposal units. However, it has been found to be very desirable, if I am to achieve my two-fold purpose: on one hand, to have a large capacity for a minimum size unit, and secondly, to make it possible to get a complete and thorough combustion of the materials normally encountered in garbage.

Garbage, or refuse, as collected from dwellings and places of business, is composed of waste food products and many combustible materials which give fuel for the carrying out of my new process. However, due to the large amount of material which would be combustible if dried, it is necessary to have very high temperatures in order that the water present, as in vegetable refuse, will be driven out and then the materials themselves can be reduced to a form where they can be thoroughly consumed.

I have found that, in order to obtain the high temperatures required in a disposal unit of this order, it is desirable to have auxiliary oil burning jets which may be used to supply auxiliary fuel to the combustible material and thus enable the operator to use as much oil as is necessary to attain the degree of heat the process requires. This relatively high temperature, however, makes it desirable to employ beneath floor 14 a layer of insulation material as 16, and then underlying this, it has been found desirable to employ brick or other material of refractory nature as 18 in order to protect the concrete bed or foundation 20.

In order to be able to work around the primary combustion chamber when in operation, I find it desirable to employ an enclosing shield as 22. This may be made of steel or other fabricated material, although where such materials are readily available, brick or concrete is more desirable.

I prefer to form shield 22 as a frustum of a cone so that the chamber will taper in at the top and thus provide a secondary combustion chamber, so that any volatiles that have not been fully consumed, but which are in gaseous form will be consumed by air which is introduced through a plurality of air openings 24 which are disposed entirely around the base of shield 22 outside of dome 12. This provides an abundance of air so that, as the gases are discharged out through the dome screen 26, they will be met while still very hot by a decided excess of fresh air and thus their combustion will be completed before they are discharged by convection from the top of the shield 22.

A secondary purpose is served by this shield which is very necessary, that is, it forms an actual shield for the primary combustion chamber dome 12, which of necessity becomes very hot and would be dangerous, would glow in the dark, and the heat given off from it would make it very difficult for workmen to get near it for servicing and recharging. The air however, which is freely admitted through ports 24, rises up over the outside of dome 12 and tends to keep the outer surface at a workable temperature. This excess heat promotes combustion of gases in the secondary combustion chamber.

The charging of my primary combustion chamber is achieved by the hopper and chute arrangement probably best illustrated in Figs. 1 and 2, wherein chute 30 is provided of ample capacity to normally take a load of garbage as it is delivered. Actual delivery of the garbage to the primary combustion chamber is controlled by the gate valve 31, which in turn is controlled by some suitable mechanism as the electric motor 32 and its associated lifting cables. The bottom floor of the hopper as 34 is at an angle greater than the normal angle of repose of the materials so that, without assistance, as soon as gate 31 is raised, material will slide down into the fire. This is an important factor when we consider the intense heat generated within the combustion chamber. It is most desirable that the final discharge of this material is substantially tangential to the inner surface of dome 12 for reasons which will be more apparent later. As the material is deposited on floor 14, it will be apparent that many of the lighter combustible materials will catch fire and be carried around by the air blast. However, to insure maximum concentration of combustion supporting air at the point of delivery, I have provided that air will be taken from the inner surface of shield 22 above dome 12, where it will be highly heated, and it is then conducted downwardly through pipe 36 under urgency of the primary air fan 38. This fan has delivery pipes as 40 and 41 directed respectively to a grill-like opening at 42, and to a central air discharge grill at 44.

These jets of heated air tend to dry the combustibles and to supply an over-abundance of air at the point where ignition takes place, so that there is a tendency for an accumulation of materials just below the discharge end 46 of hopper 30 and it has been found desirable to have this concentration of air coming from both sides, as it were, of the pile of garbage deposited so that complete and thorough ignition can be secured.

The bulk of air needed for combustion and circulating of material is provided by the tangential air supply pipes 50 and 51. These are disposed on opposite sides, preferably, in the case of two, which are normally sufficient, or if more than two are used, they should be substantially equi-spaced around the periphery. The discharge from these pipes, which is induced by the blowers at 53 and 54 respectively, is introduced into the primary combustion chamber tangentially, so that air from the two pipes 50 and 51 will operate together to cause the materials within the combustion chamber to circulate around in a given direction and at a considerable speed giving a decided swirling effect. The air intakes for fans 53 and 54 are through pipes 52 which lead from headers 55. These headers communicate by means of a number of small openings through shield 22, with the space above dome 12 and thus the air so secured is heated to a high

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temperature and very materially assists combustion within dome 12.

I have found it to be very desirable to avoid any piling up of the material in the center of the primary combustion chamber, and to avoid this I have provided at the center of floor 14, a cone 56. This cone is not merely a tuyère to introduce air but is, of necessity, a conical member of such proportions as to prevent the formation of a pile of material in the center of the dome and to assist in distributing the various materials as they are being burned so that they will travel around the outer surface of the combustion chamber and will thus be fully acted upon by the forced streams of air being introduced. It will be noted, however, that the air discharge grid 44 is fed from a conical inner chamber 58 which has the effect of providing a degree of cooling for the cone 56 and thus insures it having a much longer useful life.

Every attempt should be made in the operation of my device to employ the combustible materials found in the refuse as a source of heat. However, there will be many occasions when there is not a sufficient amount of such combustible material, and for this reason, I have provided oil burners on one or more of the access doors 67. I also provide oil jets 60 and 61 in pipes 50 and 51. Normally, I prefer that the oil burner be near the discharge end of these pipes, so that the normal oil-burning flame will be provided much after the fashion of oil burners for residences and the like, although naturally, if my unit were made of considerable size, then it would be necessary to proportionately increase the size and capacity of these burners.

As the workability of my disposal unit relies upon a very high efficiency in the combustion of the waste materials, I provide a plurality of observation windows 65 which should be disposed around the periphery of dome 12 so that various parts of the fire can be observed. The operator can then vary the intensity of the air blast and, if occasion demands, can introduce an adjustable amount of auxiliary combustion in the form of oil, so that the temperature desired can be maintained. If the temperature is raised sufficiently and the air blast is such that the materials can be kept constantly in motion, very nearly perfect combustion will occur in the primary combustion chamber. There are occasions when it may be necessary to have actual access to the chamber and to this end I have provided a plurality of access doors 67.

Method of operation

In the normal installation of my device, I prefer that a working platform be provided about on the upper level of hopper 30, and that the garbage be conveyed, preferably by an inclined conveyor, so as to discharge it to the hopper in a way that discharge can be controlled so that an excess will never accumulate in the same. The hopper, because of its close proximity to high temperatures, must of necessity be made of metal. If the hopper is maintained reasonably full, then it serves as a dam or closure for the hopper during the period that the feeding door 31 is open for charging. An ideal charging arrangement is for a small stream of material to be constantly passing into the primary combustion chamber. When so charged, the various air blasts have the maximum opportunity of promoting and supporting combustion in a manner to give the high temperatures required and to

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thus give such excellent and complete combustion as I have experienced with this equipment.

With the various air drafts properly adjusted so as to keep the material in a swirling mass, going around and around inside of the combustion chamber, it has been found that materials are quickly dried out so that the volatiles can be driven out of the same and the solids actually burned as such. It will be noted that combustion here is effected by an air pressure system, so that there is no need of a stack for the promotion of draft, as is so common in the various other incinerators that I have observed to date. Too often, in the incinerators in more common use, the introduction of materials may be tangential or otherwise, but normally the flow is from the feeding port for a portion only of a circle around the combustion chamber and then out through a stack of considerable height, and this stack provides the suction or draft. Under such conditions, it is difficult to get complete combustion, whereas in my equipment, by causing the materials to go completely around and around the combustion chamber many times, they are fully aerated and an excess of air can be provided so that the oxygen can support the combustion and the nitrogen of the air will become highly heated and in itself provide a good drying agent.

As materials are continually fed into the primary combustion chamber, it follows that a discharge must be made, and this is in the form of materials that have been volatilized and then rise up and are forced out through the discharge screen 26 located at the top of the dome. It has been found that many combustibles, mostly gases or various finely divided particles, will be driven through the screen, and it is therefore found desirable to provide the upper portion of shield 22 as a secondary combustion chamber, so that the combustion can be completed at this point, and from the ground there will be no flames visible but only very hot, clean, dry gasses being given out from the upper end of shield 22.

It is believed that it will be clearly apparent from the above description and the disclosure in the drawings that the invention comprehends a novel construction of a garbage disposal unit.

Having thus disclosed the invention, I claim:

1. A garbage disposal unit, consisting of: a primary combustion chamber of circular domed shape having a discharge opening in its top; a centrally disposed conical pillar adapted to coact with the dome shaped walls of said primary combustion chamber and provide an annular combustion chamber; a plurality of tangentially directed air jets discharging into and adapted to produce a swirling action within said primary combustion chamber; a conical shield wall disposed concentrically around said primary combustion chamber and spaced therefrom and forming a secondary combustion chamber within said shield and above the dome of said primary combustion chamber; said shield wall having combustion and circulation pre-heated air outlet openings formed therein and disposed above said dome; said primary combustion chamber having inlet openings for said pre-heated air for directing the same to the area where refuse is consumed within said primary combustion chamber; power driven fans having discharge sides connected to said tangential air jets and having intake sides connected to said outlet openings for pre-heated air; a secondary fan; a plurality of air pipes connecting said pre-heated

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air outlet openings to the intake of said secondary fan; and connecting the discharge side of said secondary fan to said inlet openings for said pre-heated air.

2. A garbage disposal unit, consisting of: a primary combustion chamber formed by an enclosing wall of circular domed shape and having upper discharge opening in its top; a centrally disposed conical pillar of such a size and construction as to provide together with said enclosing wall an annular combustion chamber; a plurality of tangentially directed, fan driven, air jets discharging into and adapted to produce a swirling action within said primary combustion chamber; a conical shield wall disposed concentrically around said primary combustion chamber and spaced therefrom; said shield wall having air outlet openings therein and disposed above said dome; a power fan and connecting pipes connected to the intake side of said fan and to said outlet openings and adapted to draw pre-heated combustion and circulation air through said outlet openings for delivery to said primary combustion chamber; said primary combustion chamber having inlet openings connected with the discharge side of said fan, for said pre-heated air directing the same to the area where refuse is consumed within the primary combustion chamber; oil burners directed into said primary combustion chamber; and said shield wall forming a secondary combustion chamber within said shield wall, above the dome of the primary combustion chamber and communicating with said primary combustion chamber by means of said upper discharge opening.

3. A garbage disposal unit, comprising: a primary combustion chamber formed by a wall of circular dome shape, having an upper discharge opening in its top; means disposed within said primary combustion chamber forming together with said dome shaped wall an annular combustion chamber within said primary combustion chamber; a plurality of air jets connecting with said primary combustion chamber and disposed to discharge air therein in a tangential manner so as to produce a swirling action within said primary combustion chamber; a shield wall of greater height than and disposed concentrically around said primary combustion chamber and spaced therefrom; said shield wall having air outlets for pre-heated, primary air formed therein for withdrawing air from within said shield wall and above said primary combustion chamber; said primary combustion chamber having inlet openings for said pre-heated air opening into the area where refuse is deposited within said primary combustion chamber; a first power driven fan for said air jets; a second power driven fan for said pre-heated air having an intake and a discharge side, and air conducting pipes operatively connecting said air outlets to said intake side of said second power driven fan and operatively connecting said inlet openings for said pre-heated air to said discharge side of said second fan; oil burners directed into said primary combustion chamber; said shield wall forming a secondary combustion chamber above the dome of said primary combustion chamber and communicating with said primary combustion chamber by means of said upper discharge opening; and said shield having air supply openings disposed around its base adapted to admit air to said secondary combustion chamber.

4. A garbage disposal unit, comprising: a primary combustion chamber formed by a wall of

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circular dome shape having a central discharge opening in its top; a conical pillar disposed in the center of said primary combustion chamber adapted to co-act with said wall to form an annular combustion chamber within said primary combustion chamber; a plurality of fan driven air jets connecting with said primary combustion chamber and disposed to discharge air therein in a tangential manner so as to produce a rotary gas movement within said primary combustion chamber; a shield wall of greater height than and disposed concentrically around said primary combustion chamber and spaced therefrom; said shield wall having air outlets for pre-heated, primary air formed therein for withdrawing air from within said shield wall and above said primary combustion chamber; said primary combustion chamber having inlet openings for said pre-heated air opening into the area where refuse is deposited within said primary combustion chamber; said shield wall forming a secondary combustion chamber above the dome of said primary combustion chamber and communicating with said primary combustion chamber by means of said central discharge opening; said shield having air supply openings disposed about its base adapted to admit air to said secondary combustion chamber; and a power driven fan for said pre-heated air having an intake and a discharge side, and air conducting pipes operatively connecting said air outlets to said intake side of said power driven fan and operatively connecting said inlet openings for said pre-heated air to said discharge side of said fan.

5. A garbage disposal unit, comprising: a primary combustion chamber formed by a wall of circular dome shape having an upper discharge opening in its top; a centrally disposed conical pillar of such shape as to form together with said wall an annular combustion chamber within said primary combustion chamber; said wall having a refuse supply opening leading into said primary combustion chamber; a shield, of greater height than said primary combustion chamber, disposed concentrically thereabout and spaced therefrom; said shield having air outlets for pre-heated air formed therein for withdrawing air from within said shield and above said primary combustion chamber; said conical pillar having inlet openings therein adjacent the area in said primary combustion chamber where refuse is deposited, and air conduits leading from said air outlets to said inlet openings in said conical pillar; a power fan connected to said air conduits and interposed between said outlets and said inlet openings for moving said pre-heated air from said outlets to said inlet openings; oil burners directed into said primary combustion chamber; combustion and circulation air jets connecting with said primary combustion chamber and disposed to discharge air therein in a tangential manner; a power blower for said air jets having an intake and a discharge side, and conduits connecting said air outlets to said intake side of said power blower and connecting said air jets to said discharge side of said power blower.

6. A garbage disposal unit, comprising: a primary combustion chamber formed by a wall of circular dome shape; a centrally disposed pillar adapted to coact with said wall to provide an annular combustion chamber; a shield disposed concentrically around said primary combustion chamber and spaced therefrom and extending upwardly above the same; said shield having air

outlet openings for pre-heated air formed therein for withdrawing air from within said shield and above said primary combustion chamber; said primary combustion chamber having inlet openings therein for directing said pre-heated air to the area where refuse is initially deposited within said primary combustion chamber, conduits connecting said air outlet openings and said inlet openings for pre-heated air, and a power driven fan connecting with said conduits and interposed between said inlet and outlet openings for moving said pre-heated air from said outlet openings to said inlet openings; access doors in said wall; oil burners, mounted on said doors, directed into said primary combustion chamber; said shield forming a secondary combustion chamber therein and outside of said primary combustion chamber; said shield having a plurality of air supply openings disposed about its base adapted to admit air to said secondary combustion chamber; combustion and circulation air jets directed tangentially into said primary combustion chamber; power driven blowers for said air jets each having an intake and a discharge side; conduits connecting said air outlet openings to said intake sides of said blowers and connecting said air jets to said discharge sides of said power blowers.

7. A garbage disposal unit, comprising: a primary combustion chamber formed by a wall of circular dome shape; a centrally disposed conical pillar of such shape as to provide with said wall an annular combustion chamber; a plurality of air jets directed into said primary combustion chamber in a tangential manner so as to produce a swirling action within said primary combustion chamber; a shield, of greater height than said primary combustion chamber, disposed concentrically around said primary combustion chamber and spaced therefrom; said shield hav-

ing air outlet openings for withdrawing pre-heated air from within said shield and outside of said primary combustion chamber; said primary combustion chamber having inlet openings for said pre-heated air for directing the same to the area where refuse is consumed within said primary combustion chamber; conduits connecting said air outlet openings and said inlet openings for pre-heated air and a power fan connected to said conduits and interposed between said inlet and outlet openings for moving said pre-heated air from said outlet openings to said inlet openings; conduits connecting said air jets and said air outlet openings for pre-heated air and a power fan connected thereto and interposed between said air jets and said outlet openings for moving air therethrough from said outlet openings to said air jets; flame producing means directed into said primary combustion chamber; said shield forming a secondary combustion chamber outside of said primary combustion chamber; said shield having a plurality of air supply openings adapted to admit air to said secondary combustion chamber; a chute leading through said shield and into said primary combustion chamber; a hopper positioned outside of said shield and connected with said chute and a door disposed between said hopper and said chute to regulate the flow of refuse into said primary combustion chamber.

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