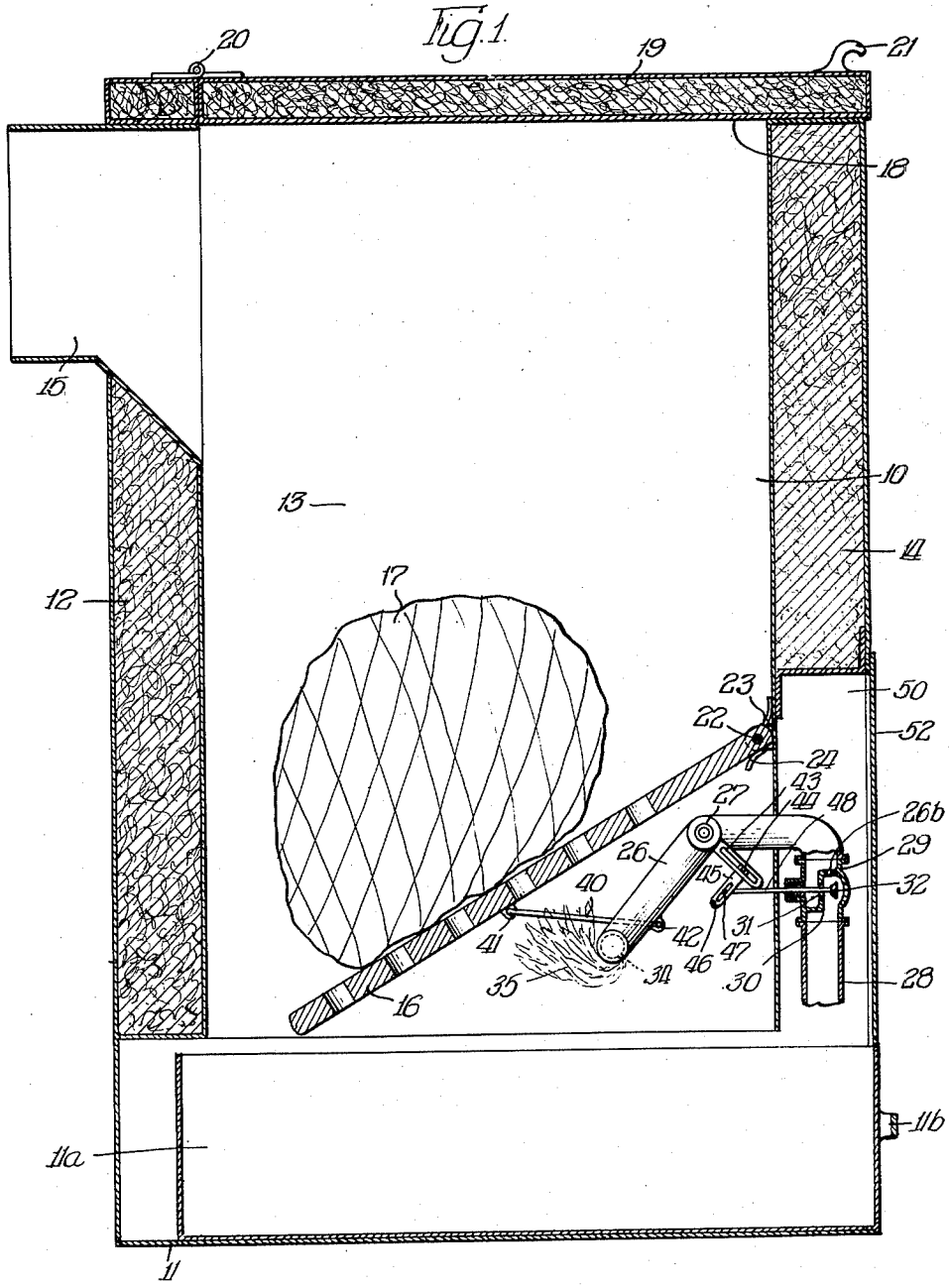
Aug. 1, 1950 J. G. AMES 2,517,074

INCINERATOR WITH BURNER MEANS RESPONSIVE TO WEIGHT OF RUBBISH TO BE BURNED

Filed July 26, 1945 3 Sheets-Sheet 1

Fig. 1.



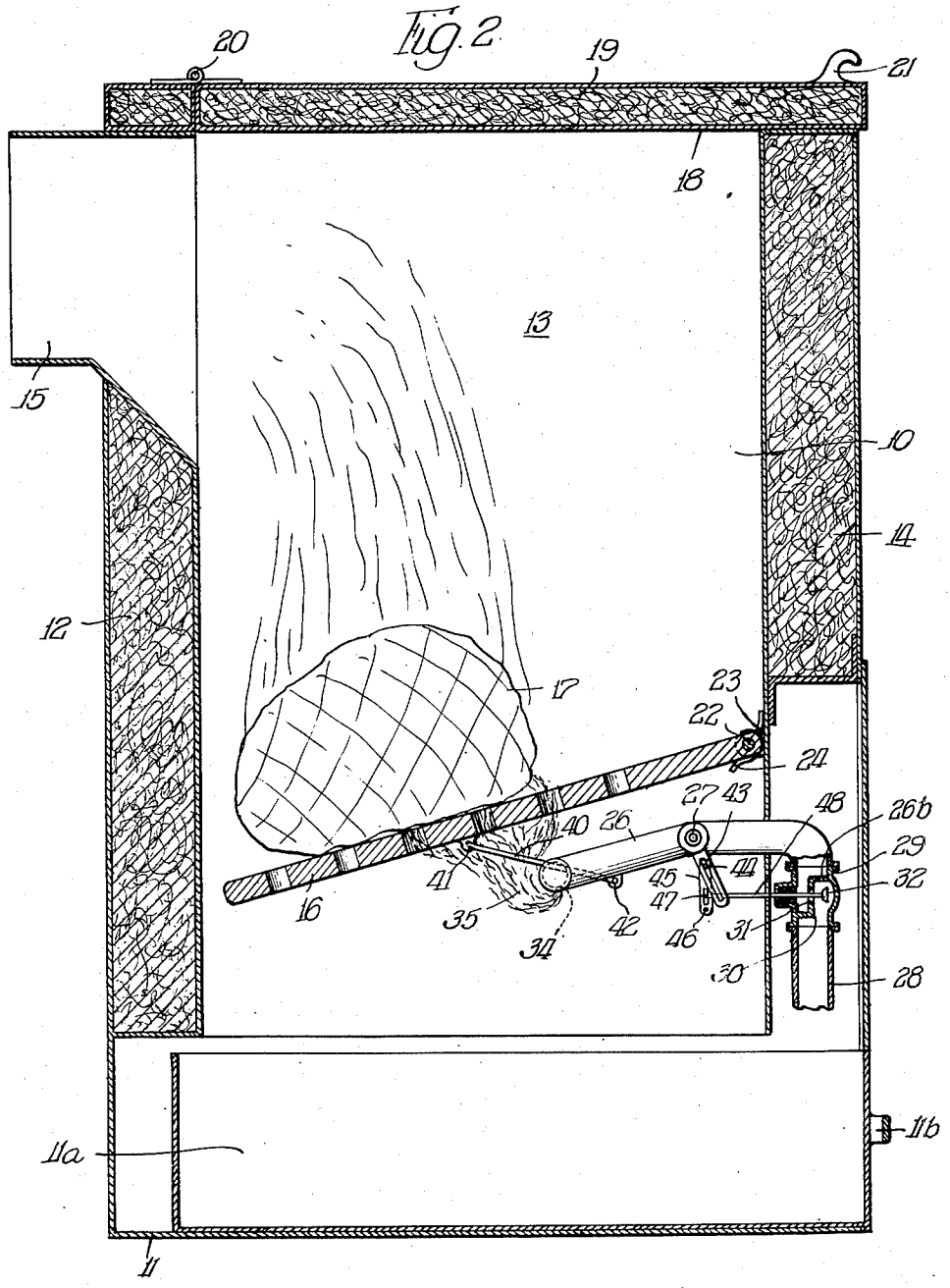
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Fig. 2



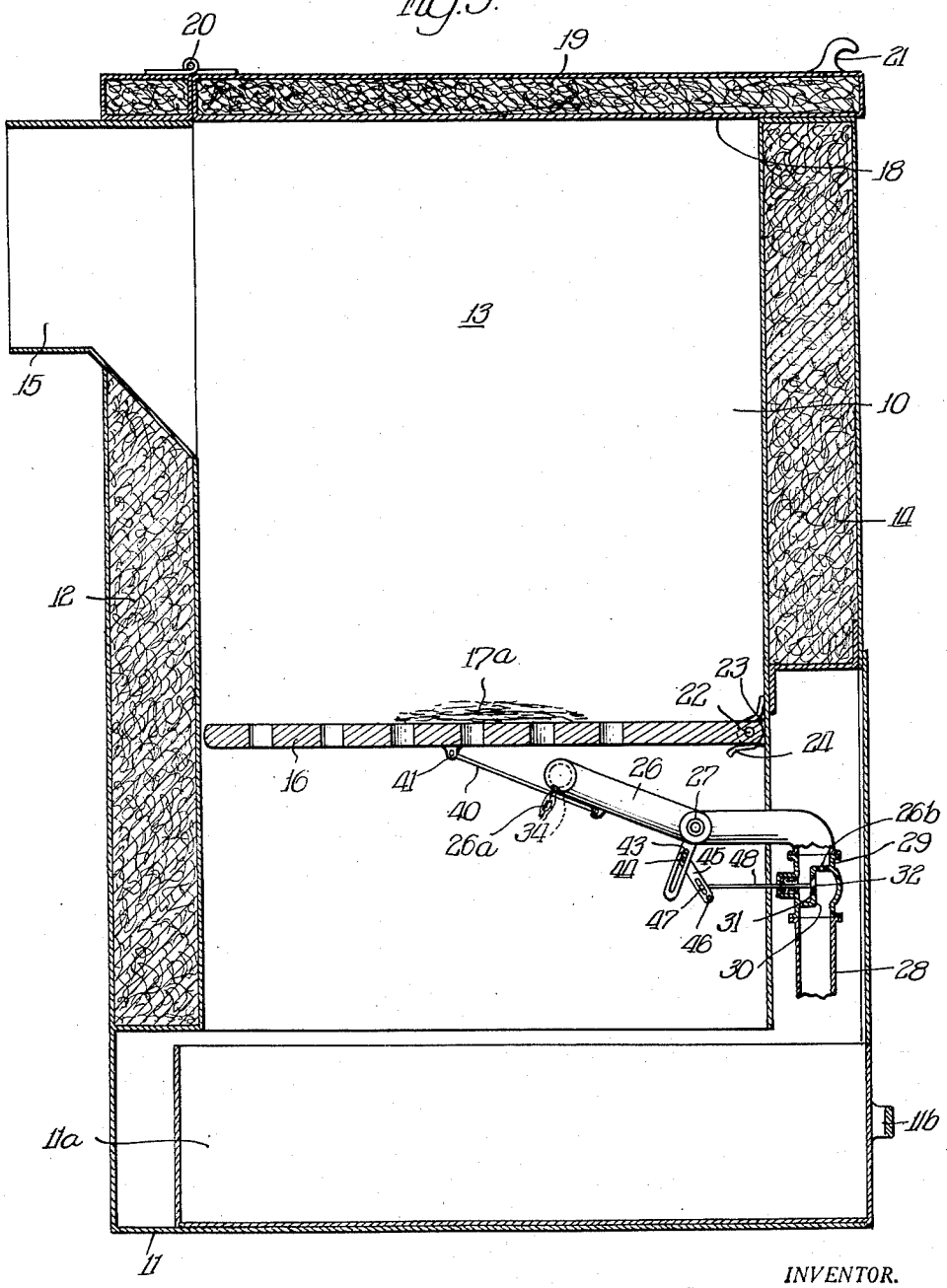
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Filed July 26, 1945 3 Sheets-Sheet 3

Fig. 3.



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2,517,074

INCINERATOR WITH BURNER MEANS RESPONSIVE TO WEIGHT OF RUBBISH TO BE BURNED

James G. Ames, Aurora, Ill.

Application July 26, 1945, Serial No. 607,130

9 Claims. (Cl. 110—18)

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This invention relates, in general, to the art of incineration, and has particular relation to an improved incinerator and method for the disposal of garbage, rubbish, and other refuse or waste material.

While the embodiment of the invention which I shall describe hereinafter in connection with the drawings is a gas-fired device particularly adapted for domestic use, it is to be understood that the invention in its broader aspects is not limited to such use but may be employed elsewhere as suitable and desired.

In the conventional incineration process a high temperature flame is made to impinge directly on a mass of wet or damp garbage. The result is scorching, which produces offensive odors, along with a heavy smoke, which have a tendency to leak out of the incinerator because of lack of sufficient draft. This lack of draft is due to the lack of high temperature, the heat of the burner flame being rapidly absorbed by the water or moisture content in the refuse.

One of the main objects of the present invention is to provide an improved incinerator and method in which the refuse is disposed of by multi-stage incineration, having a first stage in which the garbage or other refuse is dried or dehydrated (completely or partially) at a relatively low temperature and preferably without direct impingement of the flame on the refuse—for example, by relatively low temperature flue gases—and a second or ignition stage in which a hot flame impinges on the dried or dehydrated mass to burn and thereby dispose of same.

As a result of first drying or dehydrating the garbage or other refuse before igniting or burning the same, smoke and odor are very greatly reduced; carbon deposits and the resulting chimney fires are avoided, and the amount of resulting ash is reduced. Moreover, the very hot ignition flame assures a strong draft even on hot, humid days, which draft effectively carries away any small amount of smoke or odor high enough above the chimney to give good dispersement. The strong draft induced by the hot flame also seems to eliminate the pressure zone in the combustion chamber which, in turn, solves the problem of smoke, for example, in the basement.

Another and more particular object of the invention is to provide an incinerator and method in which the second or ignition stage is rendered effective automatically by the loss in weight or, more broadly stated, by the change in the character of the mass of refuse produced in the first or drying or dehydrating stage.

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Another object of the invention is to provide an incinerator and method in which the burner means is automatically turned off upon completion of the second or ignition stage for burning or disposing of the refuse.

Another object of the invention is to provide in an incinerator, in general, of the class described a movable and, more specifically, a pivoted grate or other refuse supporting means which is adapted for receiving and supporting the garbage or other refuse upon introduction of same into the incinerator and to move to different positions due to the loss of weight of the refuse in the drying stage automatically to render effective the second or ignition stage for disposing of the refuse.

Another object of the invention is to provide in an incinerator, in general, of the class described a movable and, more specifically, a pivoted grate or other refuse supporting means which is adapted for receiving and supporting the garbage or other refuse upon introduction of same into the incinerator and to move to different positions to turn on and shut off the burner means responsive to the weight or lack of weight of the refuse material.

Another object of the invention is to provide a refuse support adapted to receive refuse introduced into the incinerator chamber and to support the refuse within the chamber, and means for subjecting the refuse while in position on said support or grate to a drying or dehydrating stage and for thereafter, and with the dried or dehydrated mass remaining in position on said support or grate, subjecting it to a burning stage to burn and thereby dispose of same.

Another object of the invention is to provide a refuse support or grate for supporting the refuse in the incinerator chamber, means for moving the refuse from one position to another while maintaining it in position on the grate, and fluid fuel burner means operable to apply heat at relatively low temperature to the refuse for drying or dehydrating the same in one position, and operable to provide hot flame impingement on the refuse in another position to burn and thereby dispose of the refuse.

Another object of the invention is to provide in an incinerator, in general, of the class described, a movable and, more specifically, a pivoted gaseous fuel burner and connecting means between the burner and the grate or refuse support for moving the burner to drying and ignition positions by the movement of the grate or refuse support.

Another object of the present invention is to provide an incinerator of the class described having various features of novelty and advantages, and which is particularly characterized by its simplicity and compactness in construction, its economy in manufacture, its effectiveness in use, and its ability to dispose of the garbage or other refuse more completely and economically and with less offensive odors and smoke.

Further objects and advantages of the invention will appear from the following detailed description taken in connection with the accompanying drawings which illustrate the method of constructing and operating one form of device embodying the present invention.

In the drawings:

Figure 1 is a vertical sectional view of one form of incinerator embodying the present invention, showing the grate or refuse support in drying or dehydrating position;

Figure 2 is a vertical sectional view similar to Figure 1, showing the grate or refuse support in ignition or burning position; and

Figure 3 is a vertical sectional view similar to Figures 1 and 2 showing the grate or refuse support in the "off" position which it occupies upon completion of the firing or burning operation.

Referring now to the drawings, I have shown for purposes of illustration an incinerator having an incinerator chamber 10 defined by a bottom 11, upright walls 12, 13, and 14, and a further upright wall (not shown) opposite the wall 13.

A flue opening 15 is provided in the upper portion of the wall 12 for the escape of the products of combustion, for example, to a suitable stack. A refuse support or grate 16 is adapted to receive garbage, rubbish, and other refuse or waste material, and to support the same within the incinerator chamber 10. The refuse, indicated more or less diagrammatically at 17 in Figures 1 and 2, is introduced into the incinerator chamber 10 into position on the grate 16 through an opening 18 at the top of the chamber 10. The opening 18 has a cover 19 hinged, for example, at 20 and provided with a hook or handle 21 for raising the cover to open position for the introduction of the garbage or other refuse into the incinerator. The cover 19 is illustrated in closed position, closing the opening 18.

The walls 12, 13 and 14, and the wall opposite the wall 13, as well as the cover 19, are illustrated as formed of sheet metal lined with suitable insulating material, but this may, of course, vary. A removable ash receiving receptacle 11*a* is shown as resting on the bottom 11. A handle 11*b* is provided on the front of the receptacle 11*a* for removing same to empty any ashes which, with the present invention, are reduced to a minimum.

The grate 16, which is of perforated or openwork form, is pivoted, for example, at 22, to suitable bracket means 23 on the wall 14. Means is provided for maintaining the grate 16 in substantially the position shown in Figure 3, and for returning it to this position when it is not loaded with wet or damp garbage or other refuse, as will presently become apparent. I have illustratively shown one way of accomplishing this. A spring 24 coiled, for example, about the pin or pintle 22 on which the grate 16 is pivoted, cooperates with the bracket means 23 or wall 14 and with the grate 16 in a manner to permit the grate 16 to be depressed in a counterclockwise direction about the pivot 22 by the weight of wet or damp garbage or refuse on the grate; the spring 24 acting to return the grate to its non-depressed position, or gradually to the position shown in Figure 3 as the weight of the garbage or refuse is reduced in drying or dehydrating the same.

It is to be understood that the spring means 24 may be arranged otherwise than as shown, for accomplishing the purpose set forth. It is to be further understood that means other than spring means may be provided for returning the grate 16 from its depressed position to substantially the position illustrated in Figure 3 as the weight of the garbage or other refuse is reduced in the drying or dehydrating stage of operation. For example, the grate 16 may be counterbalanced in a manner to return without the use of spring means to substantially the position shown in Figure 3 as the weight of the garbage or other refuse is reduced.

A gas or fluid fuel burner 26 underlies the grate 16 and is pivoted at 27 for swinging movement about the pivot means 27 responsive to the swinging movement of the grate 16 about its pivot means 22. A gas or fuel supply pipe 28 is connected to the burner 26 for supplying fuel to the burner from a suitable source of supply. A valve 29 is positioned in the pipe 28 for the purpose of controlling the supply of fuel to the burner 26.

The valve 29 has a wall or partition 30 provided with a valve opening 31. A valve member 32 is adapted to seat upon an annular valve seat formed on the partition or wall 30 about the periphery of the valve opening 31 to shut off the supply of fuel to the burner 26. The valve member 32 is movable to open position away from the valve seat for the supply of fuel to the burner. The burner 26 has outlet ports 34 through which fuel issues to maintain the pilot flame shown at 26*a* in Figure 3, and, when the valve is opened, the drying and ignition flames as shown at 35 in Figures 1 and 2, respectively.

The ports 34 preferably open generally downwardly from the burner 26 as the device is viewed in Figure 2 for a purpose which will hereinafter be apparent.

The burner 26, selected for illustration, is a high-low burner having the constantly burning low or pilot flame 26*a*. The fuel for maintaining this low or pilot flame 26*a* is supplied, for example, through a restricted by-pass aperture 26*b* in the wall or partition 30 of the valve 29. Instead of using a high-low burner, the burner 26 may be merely a drying and ignition burner and a separate pilot burner or other ignition means may be provided for igniting the burner upon opening the valve member 32.

Means is provided for swinging the burner 26 about its pivot 27 by the swinging movement of the grate or refuse support 16 about its pivot 22. I have illustratively shown one way of accomplishing this, namely, by means of a link or connection 40 pivoted, for example, at one end to the grate 16 at 41, and pivoted or otherwise suitably connected at its opposite end to the burner 26, at 42.

Where the valve 29 is controlled by the movement of the grate 16, means is also provided for accomplishing this result. I have illustratively shown one way of accomplishing it, namely, by means of an arm 43 which is carried by and swings with the burner 26. This arm 43, as shown in the drawings, has pin and slot connection, at 44, with a second arm 45 to swing the second arm about its pivot 46 by the swinging movement of the burner 26. The second arm 45 has pin and slot connection, at 47, with the valve stem 48 which carries the valve member 32 and

extends outwardly from the body of the valve 29. Other forms of valve actuating connections may be employed between the valve member 32 and the burner 26 within the scope of the present invention. The second arm 45 of the particular valve actuating connection selected for illustration is for the purpose of reducing the amount of movement imparted to the valve member 32 by the movement of the burner 26.

The construction of the incinerator walls may, of course, vary widely from the showing in the drawings. In the illustrated form of the invention the fuel supply pipe 23 and valve 29 are shown disclosed in an opening 50 in the wall 14. Access to the valve 29, burner 26, and grate 16, and to the connection between the grate and burner, and also to the connection between the burner and the valve member 32, may be had through the opening 50 which is preferably provided with a removable cover 52.

In disposing of garbage or other refuse in accordance with the present invention, the following sequence is followed:

The cover 19 is opened and the garbage or other refuse, in wet or moist condition, is introduced through the opening 18 into the incinerator chamber 13 in position on the grate 16. The water or moisture content in the mass of refuse, as indicated at 17 in Figure 1, makes the mass of refuse relatively heavy. As a result, the grate 16 is depressed in a counterclockwise direction about its pivot means at 22, from substantially the position shown in Figure 3 to substantially the position shown in Figure 1.

The downward movement of the grate 16 swings the burner 26 from the position shown in Figure 3 to the position shown in Figure 1. The downward movement of the grate 16 also opens the valve 29 through the arms 43 and 45 to establish a full supply of fuel to the burner 26. The fuel which issues from the outlet ports 34 of the burner 26 is ignited by the pilot flame 26a to produce the drying and ignition flame, as indicated at 35.

In the depressed position of the grate 16 as shown in Figure 1, and with the burner 26 positioned accordingly, the wet or moist refuse is subjected to a drying or dehydrating stage at a relatively low temperature and preferably without direct impingement of the flame 35 on the refuse. This absence of direct flame impingement at this time is the result of the location of the ports 34, as previously described, and the downward movement of the burner 26 responsive to the downward movement of the grate 16. In this stage of the process the moisture content of the refuse 17 is distilled off or expelled and, as a result, the refuse is dried or dehydrated without scorching and without objectionable smoke or offensive odors. Where I refer herein and in the claims to drying or dehydrating the refuse, I intend to cover either complete or partial drying or dehydration of the material.

As the moisture is distilled off or expelled (garbage averages about 95% moisture), the weight of the refuse is gradually reduced until finally the grate 16 starts to move upwardly about its pivot 22 until the grate 16 and burner 26 reach the position shown in Figure 2. In this position the grate 16, burner 26, and refuse 17 are in the ignition stage of the process. The valve 29 remains open sufficiently to maintain the "high" flame 35 which is brought relatively close to the grate 16 and impinges through the openings in the grate 16 directly on the dried or dehydrated mass

of refuse to burn and dispose of same without objectionable smoke or offensive odors. Combustion of the dried or dehydrated refuse in the ignition stage is fast, being usually completed in a few minutes.

As the dried or dehydrated refuse is ignited to burn and thereby dispose of the same, the grate 16 and burner 26 continue to rise until they reach the "off" position as shown in Figure 3. As the grate 16 and burner 26 reach the "off" position, the valve 29 is closed automatically through the arms 43 and 45.

In carrying out the invention, the previously dried or dehydrated refuse is extremely combustible at the ignition stage of the process. The result is a fast burning hot flame which thoroughly consumes everything combustible, leaving only a surprisingly small amount of fine ashes as indicated at 17a in Figure 3. The very hot flame assures a strong draft even on hot, humid days, which carries any small amount of smoke or odor high enough above the chimney to give good dispersement. The strong draft induced by the hot fire seems to eliminate the pressure zone in the combustion chamber, which in turn solves the problem of smoke in the basement. Moreover, as already pointed out, smoke and odor are very greatly reduced, and the two stage incineration according to the present invention seems noticeably to reduce the amount of ashes resulting.

My improved method of incineration may be practiced with a wide variety of other forms of apparatus than the particular apparatus selected for illustration. For example, the feature of subjecting the refuse while in position on the grate or refuse support to a drying or dehydrating stage, and particularly to a drying or dehydrating stage at a relatively low temperature and without direct impingement of the flame on the refuse, and for moving the dried or dehydrated refuse to a different position while maintaining it on the grate or refuse support and, with the refuse in such different position and while remaining on the grate or refuse support, subjecting it to a burning stage, and particularly a burning stage in which a hot flame impinges on the dried or dehydrated mass to burn and thereby dispose of same, may be carried out in the manner disclosed in my copending application Serial No. 607,181, filed July 26, 1945, now Patent Number 2,493,939, dated January 10, 1950.

It is to be understood, therefore, that the embodiment of the invention shown in the drawings is for illustrative purposes only, and it is to be expressly understood that the drawings and the accompanying specification are not to be construed as a definition of the limits or scope of the invention, reference being had to the appended claims for that purpose.

I claim:

1. In a multi-stage incinerator having a drying stage and a firing stage, in combination, means for supporting the refuse, means for subjecting the refuse to a heating stage in which it is dried by the heat of a flame at relatively low temperature and without direct impingement of the flame on the refuse, and thereafter to a burning stage in which the dried refuse is burned by direct impingement of the flame thereon, and means for moving the refuse supporting means to move the refuse from said heating stage to said burning stage by change in weight produced in the refuse in the drying stage.

2. In apparatus of the class described, in combination, an incinerator chamber, a perforate

refuse supporting grate mounted in position to underlie and support refuse introduced into said chamber and for movement downwardly from a raised position by the weight of refuse thereon, burner means operable in the lowered position of the grate for subjecting the refuse thereon to a dehydrating heat at relatively low temperature and without flame impingement upon the refuse gradually to dehydrate and reduce the weight of the refuse on the grate, means for moving the grate upwardly toward said raised position with the dehydrated refuse thereon as the weight of the refuse on the grate is reduced, and burner control means rendered operative by the upward movement of the grate for controlling said burner means whereby to cause impingement of a relatively hot flame upon the dehydrated refuse to ignite and burn the same.

3. Apparatus according to claim 2 wherein said last mentioned burner control means is rendered operative for causing impingement of the relatively hot flame upon the dehydrated refuse to ignite and burn the same before the grate reaches its fully raised position and wherein there is means operative by the upward movement of the grate as it reaches fully raised position to extinguish said ignition flame.

4. Apparatus according to claim 2 wherein the burner means operable in the lowered position of the grate for subjecting the refuse thereon to a dehydrating heat at relatively low temperature and the burner control means rendered operative by the upward movement of the grate for causing impingement of a relatively hot flame upon the refuse to ignite and burn the same comprises burner means mechanically connected to said grate and rendered operative to apply the dehydrating heat at relatively low temperature and the relatively hot flame to ignite and burn the refuse by the movement of the grate to lowered position and by movement of the grate upwardly from such position.

5. Apparatus according to claim 2 wherein the burner means operable in the lowered position of the grate for subjecting the refuse thereon to a dehydrating heat at relatively low temperature and the burner control means rendered operative by the upward movement of the grate for causing impingement of a relatively hot flame upon the refuse to ignite and burn the same comprises movably mounted burner means having port means directed generally downwardly away from the grate when the grate is in lowered position, and means mechanically connecting the grate to said burner means to move said burner means upwardly with the upward movement of the grate, the mounting and arrangement of said grate and burner means being of a character to reduce the distance between the grate and the port means of said burner means as said burner means moves upwardly with said grate.

6. In apparatus of the class described, in combination, an incinerator chamber, a perforate refuse supporting grate pivoted in position to underlie and support refuse introduced into said chamber and for swinging movement downwardly from a raised position by the weight of refuse thereon, burner means operable in the lowered position of the grate for subjecting the refuse thereon to a dehydrating heat at relatively low temperature and without flame impingement upon the refuse gradually to dehydrate and reduce the weight of the refuse on the grate, means for swinging the grate upwardly toward said raised position with the dehydrated refuse thereon as the weight of the refuse on the grate is reduced, and burner control means rendered operative by the upward swinging movement of the grate for controlling said burner means whereby to cause impingement of a relatively hot flame upon the dehydrated refuse to ignite and burn the same.

7. Apparatus according to claim 6 wherein said last mentioned burner control means is rendered operative for causing impingement of the relatively hot flame upon the dehydrated refuse to ignite and burn the same before the grate reaches its fully raised position and wherein there is means operative by the upward swinging movement of the grate as it reaches fully raised position to extinguish said ignition flame.

8. Apparatus according to claim 6 wherein the burner means operable in the lowered position of the grate for subjecting the refuse thereon to a dehydrating heat at relatively low temperature comprises pivoted and ported burner means and wherein the burner control means rendered operative by the upward movement of the grate for causing impingement of a relatively hot flame upon the refuse to ignite and burn the same comprises means mechanically connecting said grate to said pivoted burner means to swing the ported portion of said burner means to position to apply the dehyrating heat at relatively low temperature in the lowered position of the grate and to swing the ported portion of said burner means to position to apply the hot flame to ignite and burn the refuse as the grate swings upwardly.

9. Apparatus according to claim 6 wherein the burner means operable in the lowered position of the grate for subjecting the refuse thereon to a dehydrating heat at relatively low temperature comprises pivoted and ported burner means and wherein the burner control means rendered operative by the upward movement of the grate for causing impingement of a relatively hot flame upon the refuse to ignite and burn the same comprises a fuel supply pipe for said burner means, a valve in said pipe, means mechanically connecting said grate to said pivoted burner means to swing the ported portion of said burner means to position to apply the dehydrating heat at relatively low temperature in the lowered position of the grate and to swing the ported portion of said burner means to position to apply the hot flame to ignite and burn the refuse as the grate moves upwardly, and means mechanically connecting said burner means to said valve to close said valve by the upward movement of the grate as it reaches fully raised position.

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