

March 24, 1931.

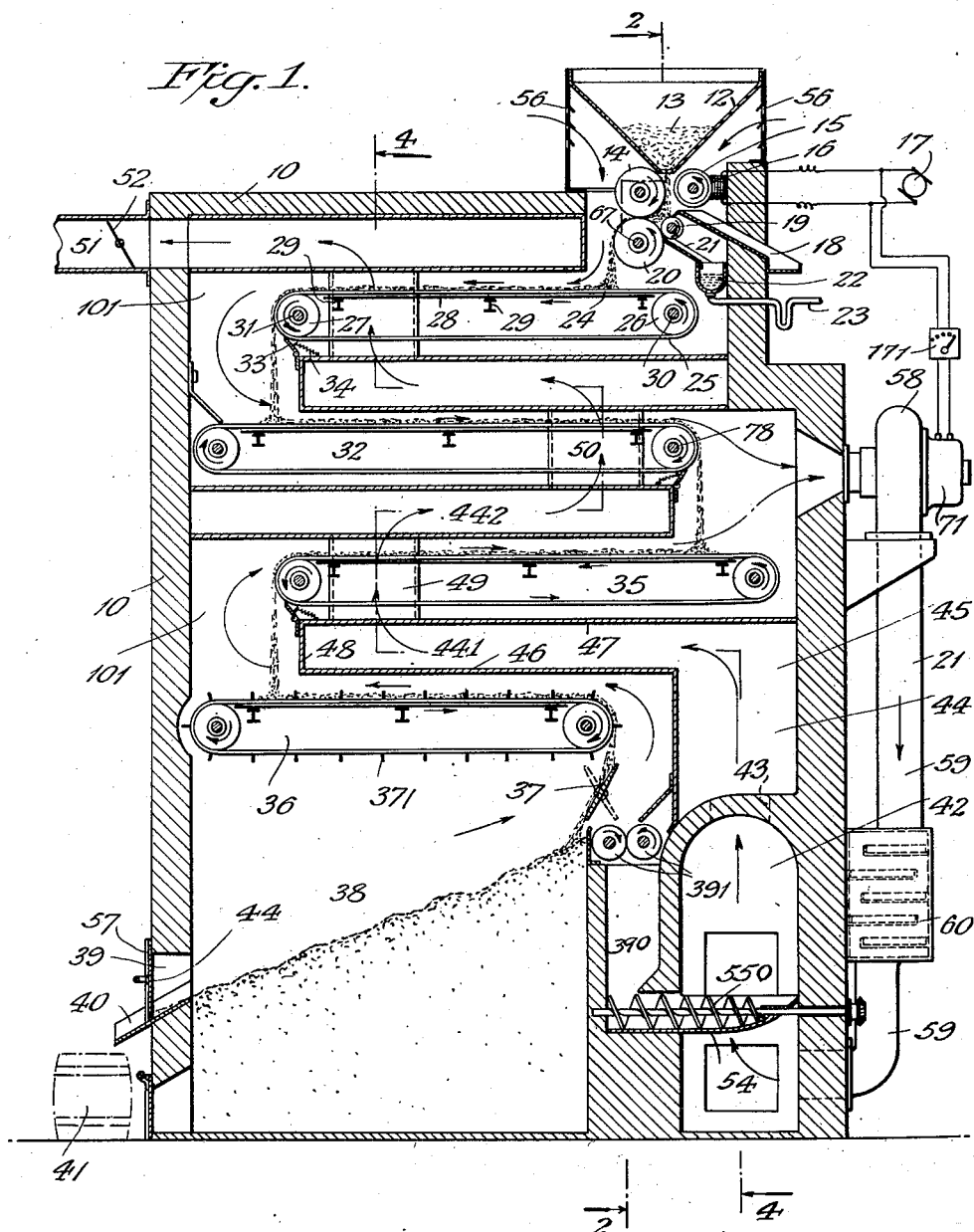
J. H. FEDELER

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APPARATUS FOR TREATING ORGANIC MATERIAL

Filed Feb. 12, 1927

3 Sheets-Sheet 1



Inventor
John H. Fedeler
By his Attorneys
Whifford & Sene

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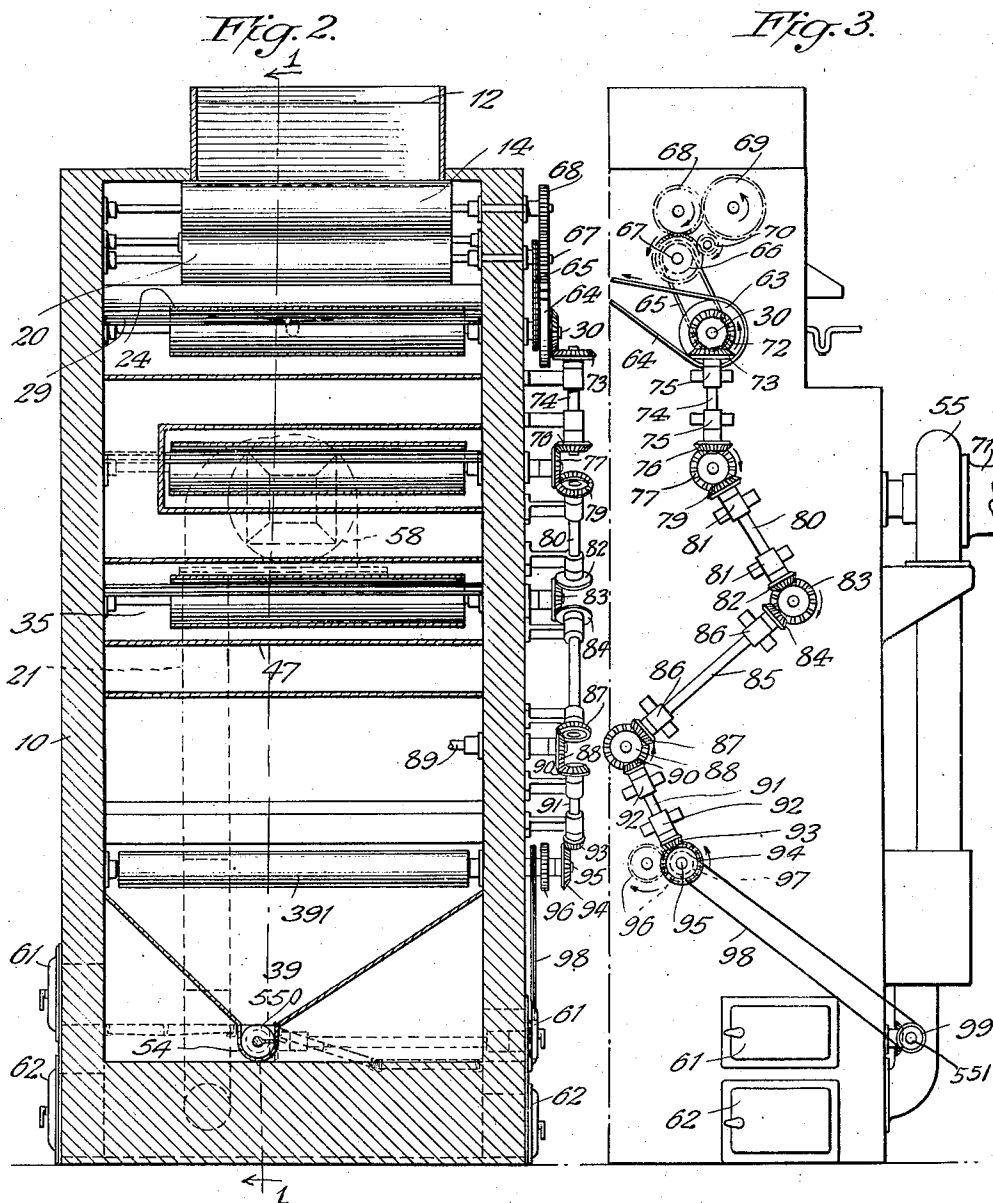
J. H. FEDELER

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APPARATUS FOR TREATING ORGANIC MATERIAL

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3 Sheets-Sheet 2



Inventor
John H. Fedeler
 By his Attorneys,
Shaffer & Lane

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J. H. FEDELER

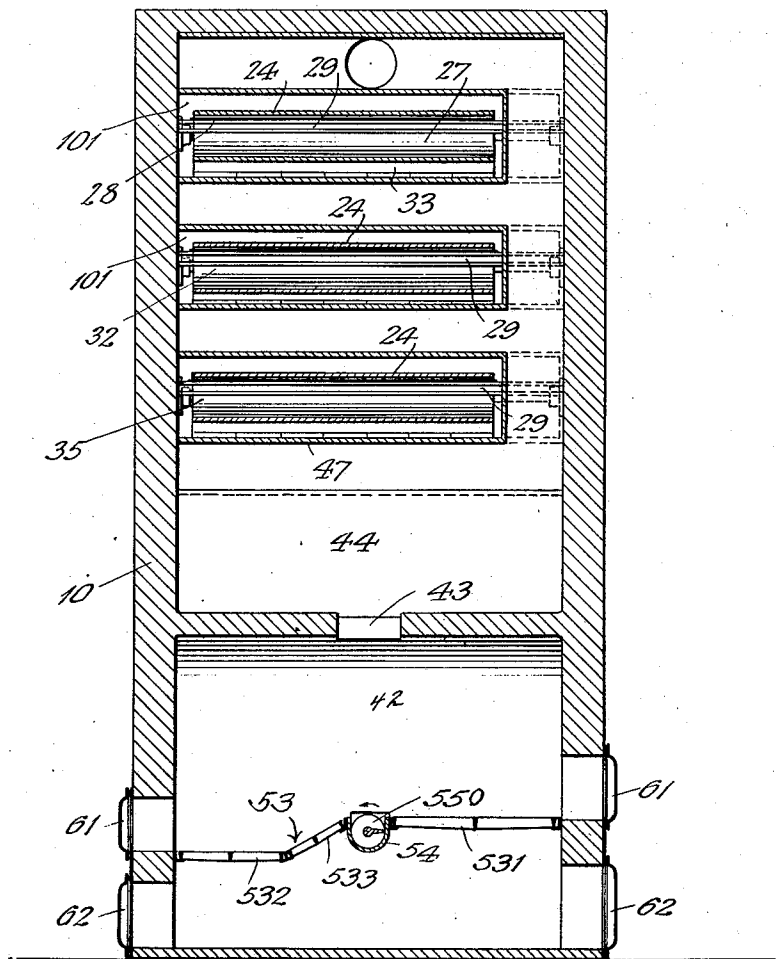
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Fig. 4.



INVENTOR.
John H. Fedeler
BY *Gifford & Co.*
ATTORNEYS.

UNITED STATES PATENT OFFICE

JOHN H. FEDELER, OF NEW YORK, N. Y.

APPARATUS FOR TREATING ORGANIC MATERIAL

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My invention more particularly relates to an apparatus for treating organic material such as garbage, by which the material not only is brought into a condition such that it may readily be transported and without objectionable odors, but is made useful as feed for animals such as chickens or hogs, and may also be used as fertilizer.

My invention will best be understood by reference to the accompanying drawings, in which I have illustrated a preferred embodiment of my invention and in which Fig. 1 is a vertical longitudinal section taken along the line 1—1 of Fig. 2 through a device for carrying out my invention; Fig. 2 is a section taken along the plane of the line 2—2 of Fig. 1; Fig. 3 is a partial side view of Fig. 2, and Fig. 4 is a vertical section taken on the plane of the line 4—4 of Fig. 1.

Like reference characters indicate like parts throughout the drawings.

Referring now to the drawings, 10 is a setting or casing for the device made of any suitable material, such as metal or firebrick, preferably suitably insulated (the insulation not being shown) and provided at the top with a hopper 12 into which the material 13, such as garbage, to be treated is charged. The material is discharged through the lower portion of the hopper between rolls 14 and 15 which are suitably actuated in a manner which will hereinafter be more fully described. The two rolls 14 and 15 serve partially to crush bulky material, such as cabbage heads, tin cans, etc. The roll or rolls 15 are preferably magnetized by a magnet 16 included in an electric circuit with a suitable source of electric energy, which is here illustrated as a dynamo 17. The magnetized roll or rolls 15 attracts metal bodies, such as tin cans, knives, forks, and spoons, and carries them to a trough 18 by which they are removed from the device. The organic material then falls on to a distributing member, which is here illustrated as a roll 19, which serves to deliver the material between the crushing roll 14 and a complementary crushing roll 20. Preferably the surfaces of the rolls 14 and 20 are roughened in order to carry the material to a position therebetween. The

rolls 14 and 20 are preferably forced together with considerable pressure, thereby removing to a large extent the liquid content of the organic material. In case a roll 19 is used as the distributing member for the material, it is preferably perforated or otherwise formed to permit the liquid which is squeezed from the organic material by the crushing rolls 14 and 20 to flow through the roll 19 over a plate or apron 21 which conducts it to a trough or receptacle 22 from which the liquid may be withdrawn through a suitable pipe 23.

The organic material from which the moisture has thus been squeezed, is passed through a chamber 101 in the device preferably of zig-zag form, and preferably in a plurality of layers, the material falling successively from layer to layer and being subjected to heat during its passage through the chamber. In the embodiment of my invention illustrated, the material as it falls over the crushing roll 20, is received on a carrier 24 which is here illustrated as an endless belt 25, passing over rolls 26 and 27 at the ends, the upper run of the belt preferably being supported by a plate 28 which is in turn supported on suitable beams 29. The material is carried towards the left as viewed in Fig. 1. The rolls 26 and 27 are mounted on shafts 30 and 31 having suitable bearings and which are suitably driven. Obviously other forms of carriers, such as movable transverse plates which scrape the material along a horizontal plate, could be used.

As the material falls from the end of the carrier 24, it falls upon a second carrier 32. Preferably, a scraper 33 is provided which engages the belt 25 beneath the roll 27 and removes any of the material that may have a tendency to adhere to the belt. The scraper 33 may be forced against the belt by a spring 34.

The carrier 32 may be the same as or similar to the carrier 24 except that the speed thereof is preferably less than the speed of the carrier 24. It is desirable in moving the material through the chamber 101 that the layers should be approximately uniform in thickness. The layers are subjected to heat,

and if any layer became unduly thin, it might result in its becoming charred and injured. The material, as it is received on the carrier 24 contains more liquid than does the material on the carrier 32 as a certain part of the moisture has then been removed by the heat. The material on the carrier 32 is, therefore, less bulky than is the material on the carrier 24, and it is preferably moved at a slower rate than is the material on the carrier 24, by mechanism which will be more fully hereinafter explained, and thereby maintain a layer which is of substantially the same thickness as the layer on the carrier 24.

The material falling from one layer to the next, serves to break up and loosen the same and at the same time mix it so that parts thereof which were on the interior of the uppermost layer on the carrier 24 may be exposed to the air which is passing over the same on the next lower layer on the carrier 32. The material on the carrier 32 is moved towards the right, as viewed in Fig. 1, and falls over the right-hand roll onto a succeeding carrier 35 on which it is moved towards the left, as viewed in Fig. 1, and falls over the left-hand roll onto a last carrier 36 which moves it along until it is discharged over the right-hand roll. As the material falls from the last carrier, it may be directed by a plate or vane 37, when in the full line position, into a suitable receptacle or bin 38, or by moving the plate or vane 37 to the dotted line position, the material may be directed, in whole or in part, to a chamber 39 from which it is carried to the furnace for the purposes of fuel. It will, of course, be understood that by suitably regulating the position of the plate 37, all or any portion of the material may be utilized as fuel in the furnace.

The belt of the last carrier or conveyor 36 is preferably provided with outwardly extending teeth or plates 371 so that in the event that the material in the receptacle 38 is piled up against the lower run of the carrier, the teeth or plates engage the same and move it along towards the left, as viewed in Fig. 1, to a position where it will be discharged through an opening 39 into a spout 40 which leads to a position above the receptacle 41 in which the material is to be conveyed or carried away. In passing to the chamber 390, the material is preferably fed between rolls 391 which serve to keep the furnace flames from entering the chamber 101 through which the material passes.

The material as it passes through the chamber 101 is subjected to heat which, in the embodiment illustrated, is produced by the hot gases from a furnace 42. The hot gases from the furnace pass through an opening 43 in the top arch or roof thereof and through a flue 44 which leads from a throat 45, as indi-

cated in Fig. 1, between the roof plate 46 above the lowermost carrier 36 and the plate 47, beneath the carrier 35, through a portion of the flue 441, the plates 46 and 47 being connected at their ends and at the left, as viewed in Fig. 1, by a plate 48. The hot gases flow upwardly from the portion 441 of the flue through an opening 49 to a flue portion 442, through which the gases flow in contact with the plates enclosing the carriers to an opening 50, and the flow of the gases thus continues to the outlet flue 51 which is controlled by a damper 52. The flue portions are thus located between the chambers through which the layers of material pass.

The grate in the lower portion of the furnace is indicated generally at 53 and preferably comprises a relatively higher portion 531 and a relatively lower portion 532, the latter having an upwardly inclined portion 533 at the edge of which is located a trough or gutter 54, preferably having a lower cylindrical portion in which is located a screw conveyor 55 which, when the material treated in the device is to be burned in the furnace, receives it at the lower portion of the chamber 39, and conveys it into the furnace, the material being fed downwardly over the inclined portion 533 of the grate, forming a fuel bed on the lower portion 532. The higher portion 531 of the grate is provided for the purpose of disposing of relatively coarse material, such as boxes, which naturally accumulate around hotels, the kitchens of dwellings, and other places where my device may be used.

Air is preferably used for the purpose of drying out the material, and in the embodiment of my invention illustrated, is drawn between plates or louvres 56 located beneath the hopper 12 and the positions of which may be regulated as usual with louvres to control the amount of air passing over the material. The air so passing between the plates or louvres 56 is drawn over the layer of material of the upper carrier 24 and thence over the material on the carrier 32. The air so drawn through the louvres 56 preferably serves to ventilate the room or space in which, or adjacent to which, the device is located and which is, therefore, an important feature where the device is used in poorly ventilated kitchens or other rooms. At the same time, in the embodiment of my invention illustrated, air is drawn through the opening 39 above the material in the bin 38, the flow of air thereto preferably being controlled by an adjustable door 57. The air so drawn through the opening 39 and through the receptacle 38 passes over the layer of material on the lowermost carrier 36, and thence over the material on the carrier 35 in the direction indicated by the arrows where, in the embodiment of my invention illustrated, it joins the air which has been drawn down-

wardly over the carriers 24 and 32 in the direction indicated by the arrows, and the mixed air is withdrawn from the device by a blower or fan 58 which forces it through a pipe 59 and preferably through a deodorizing device which is here illustrated as an ozonator 60 from which the air continues through the pipe or conduit 59 to the ash pit beneath the grate. Doors 61 and 62 are preferably provided for affording access to the furnace and to the ash pit, respectively.

Referring now to Figures 2 and 3 particularly, 63 is a member, here shown as a pulley driven from any suitable source of power, illustrated as a belt 64. The pulley 63 is mounted on the shaft 30 driving the roll 26 for the carrier 24. A second pulley (not clearly illustrated in Figs. 2 and 3) is provided which is engaged by the lower end of a belt 65 which engages a pulley 66 on the shaft 67 on which is mounted the lower crushing roll 20. A train of gears 68, 69 and 70 are mounted respectively on the shafts for the upper crushing roll 14 for the magnetized roll or rolls 15 and the distributing roll 19 and which are interlocked and of such size as to give to these rolls the desired speeds.

The blower 55 is actuated, in the embodiment illustrated, by a motor 71 which may be actuated by the dynamo 17 as illustrated, and the speed of which may be varied by the rheostat 171. It will, however, be understood that the blower may be actuated by a pulley or equivalent means, the speed of which may also be varied in a known manner. The other movable parts of the device are actuated, in the form illustrated, from the driving pulley 63, a bevel gear 72 being secured to the shaft 30 and which meshes with a bevel gear 73 secured on a shaft 74 having its bearings at 75. On the lower end of the shaft 74 is a bevel gear 76 which engages a bevel gear 77 on the shaft 78 for the right-hand roll of the carrier 32. The ratio of the teeth between the bevel gears 76 and 77 and between the bevel gears 72 and 73 is such that the roll for the carrier 32 is driven at a lower speed than the rolls for the carrier 24 for the purpose heretofore noted.

The bevel gear 77 in turn meshes with a bevel gear 79 secured on a shaft 80 having its bearings at 81. To the lower end of the shaft 80 is secured a bevel gear 82 meshing with a bevel gear 83 secured on the shaft for the right-hand roll of the carrier 35 as viewed in Fig. 1. It will be noted that the bevel gear 82 is of smaller diameter and has a fewer number of teeth than the bevel gears 79 so that the carrier 35 is driven at a slower speed than the carrier 32. A bevel gear 84 meshes with the bevel gear 83 and is secured to a shaft 85 having its bearings at 86 and to the lower end of which is secured a bevel gear 87 meshing with a bevel gear 88 on the

shaft 89 on which is secured the right-hand roll, as viewed in Fig. 1, for the lowermost carrier 36, the ratio being such that the carrier 36 is driven at a still lower speed than the carrier 35.

A bevel gear 90 secured on the upper end of a shaft 91 having its bearings at 92 and to the lower end of which is secured a bevel gear 93 meshing with a bevel gear 94 secured on the shaft 95 for the right-hand roll 391, as viewed in Fig. 1. The two shafts carrying the two rolls 391 are driven in opposite directions in such a way as to feed the material at it is discharged from the last carrier 36 into the chamber 39, when the plate 37 is in the dotted line position, by meshing gears 96.

Secured on the shaft 95 is a pulley 97 (indicated by dotted lines in Fig. 3) which drives the shaft 551 for the screw conveyor 550 by a belt 98 which also engages a pulley 99 on the screw conveyor shaft.

During operation, the temperature to which the material is subjected, is kept sufficiently low to prevent it from charring which would injure it as a food for animals and make it less effective as a fertilizer. The conversion of the moisture present in the material into vapors in the air serves to keep the temperature of the material down, and this temperature may be regulated by the louvers 56 and the adjustable door 57, and also by the adjustment of the speed of the fan. Preferably, the air is withdrawn from the device at least by the time that it reaches the saturation point. By withdrawing the air from the device at an intermediate portion of the chamber 101 as illustrated, the air passing downwardly over certain layers of the material serves rapidly to dry the material and deprive it of a large percentage of its moisture. At the same time, the air drawn through the door 57 and upwardly over the material to the blower, serves further to dry the material and at the same time keeps down the temperature thereof below the point of combustion and sufficiently low to prevent it becoming charred or otherwise injured. At the same time, the heat is sufficient to sterilize the material during its passage through the device and prevents its undergoing decomposition. The dryness of the material may be regulated, with a given heat and air supply, by varying the speed of the carriers, thereby varying the time required for the material to pass through the device.

It will be noted that the furnace gases are excluded entirely from contact with the material, thereby preventing flames from coming in contact therewith and subjecting the material being treated to any deleterious gases that might be present in the furnace gases. The air drawn from the device by the blower 58 is deprived largely of its deleterious odors by the ozonator 60 or other deodorizing device and such objectionable gases or

vapors as may be present in the air as it leaves the ozonator are substantially consumed in the furnace 42 so that the gases escaping through the outlet flue 51 may be discharged in a populated neighborhood without serious objection.

The material so treated, as indicated, may be used as feed for animals, or by placing it in a suitable receptacle in the presence of moisture it may be permitted to ferment and brought into suitable condition as a fertilizing material.

The device reduces the bulky and objectionable material to a condition in which it has little bulk and therefore easily transported, and also to a condition where it is deprived of its objectionable qualities.

While I have illustrated the preferred embodiment of my invention, it will, of course, be understood that it is susceptible of various modifications and that such modifications would come within the scope of my claims.

It will, for example, be understood that the furnace could be separated from the remaining portion of the device; in fact, any waste gases could be utilized for the drying apparatus.

I claim:

1. In a device comprising a zigzag chamber for treating organic material, means for carrying the material in layers through the zigzag portions of said chamber, a zigzag flue having a zigzag portion located between the layers of material, a furnace for supplying heated air to said flue, out of contact with the material, and means for forcing air over said layers and conducting the same away from the material to said furnace.

2. In a device comprising a zigzag chamber for treating organic material, means for carrying the material in layers through the zigzag portions of said chamber, means for forcing air over said material, a zigzag flue having zigzag portions located between the layers of material, a furnace for supplying heated air to said flue, and means for exhausting air from the chambers in which said layers are located and conducting the same to said furnace.

3. In a device comprising a zigzag chamber for treating organic material, means for carrying the material in layers through the zigzag portions of said chamber, a zigzag flue having a zigzag portion located between the layers of material, a furnace for supplying heated air to said flue, and means for exhausting air from an intermediate portion of said zigzag portions and conducting the same to said furnace.

4. In a device comprising a zigzag chamber for treating organic material, means for carrying the material in layers through the zigzag portions of said chamber, a zigzag flue having zigzag portions located between the

layers of material, a furnace for supplying heated air to said flue, and means for delivering treated material to the furnace.

5. In a device comprising a zigzag chamber for treating organic material, means for carrying the material through the zigzag portions of said chamber in layers, a zigzag flue having zigzag portions located between the layers of material, a storage receptacle, a furnace for supplying heated air to said flue, and means for delivering the treated material at will to said furnace or to said storage receptacle.

6. In a device comprising a chamber for treating organic material, means for moving the material to be treated through said chamber, means for forcing air over said material, a furnace, means for heating said material by gases from the furnace out of contact with the material, a storage bin, and means for delivering treated material to the furnace or to the storage bin at will.

7. In a device comprising a chamber having a plurality of portions for treating organic material, means for forming in the portions of said chamber a plurality of layers of the material, a storage bin, a furnace, means for delivering treated material either to said storage bin or to said furnace, and means for passing air over the material in said storage bin and thence over the material being treated.

8. In a device comprising a chamber for treating organic material, means for moving the material to be treated through said chamber, means for forcing air over said material, a furnace constructed and arranged to burn waste material, means for heating said organic material by gases from the furnace out of contact with the material, a storage bin, and means for delivering treated material to the furnace or to said storage bin at will.

JOHN H. FEDELER.