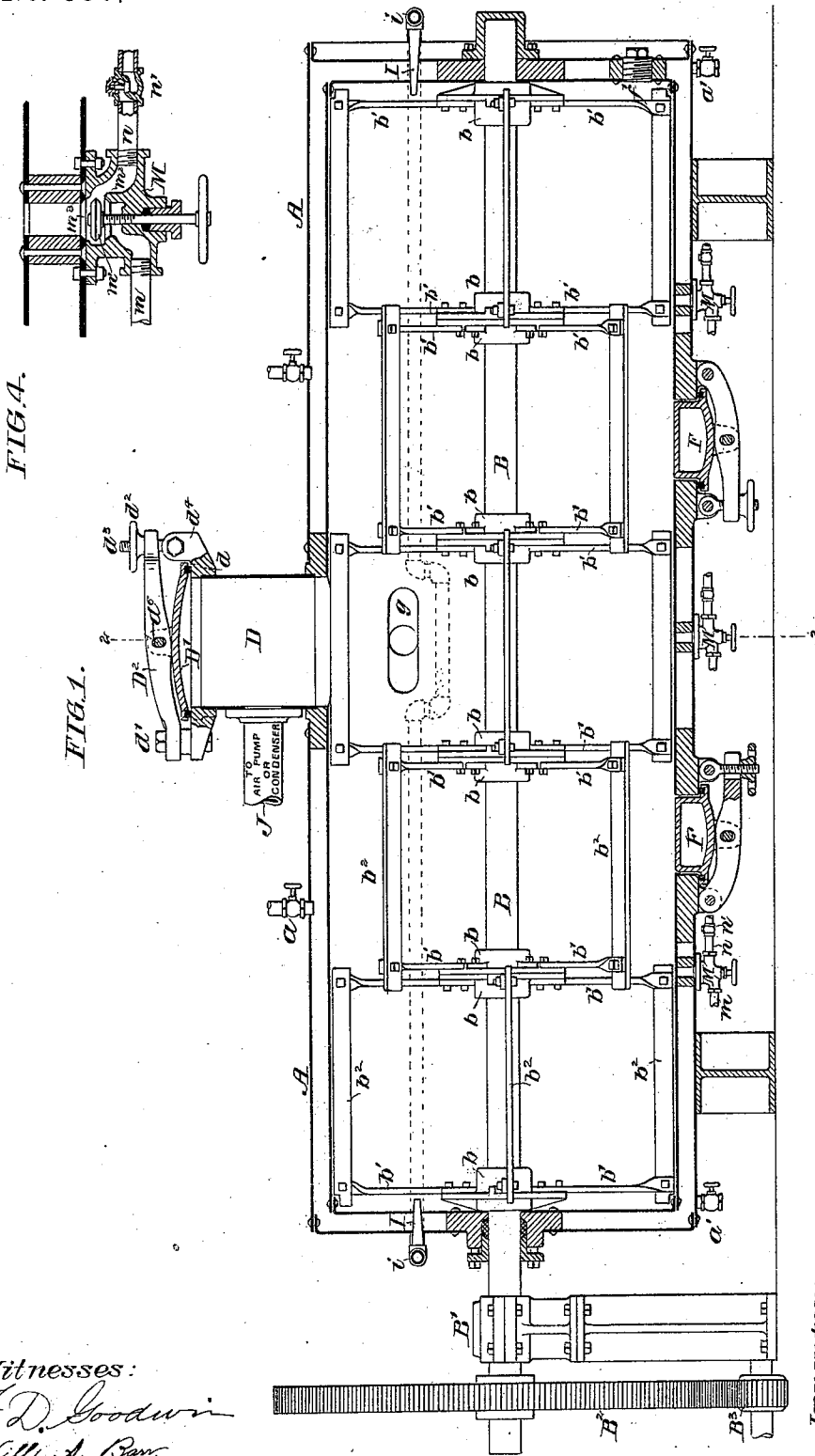


B. F. HOWLAND.

PROCESS OF AND APPARATUS FOR TREATING GARBAGE.

No. 550,270.

Patented Nov. 26, 1895.



Witnesses:

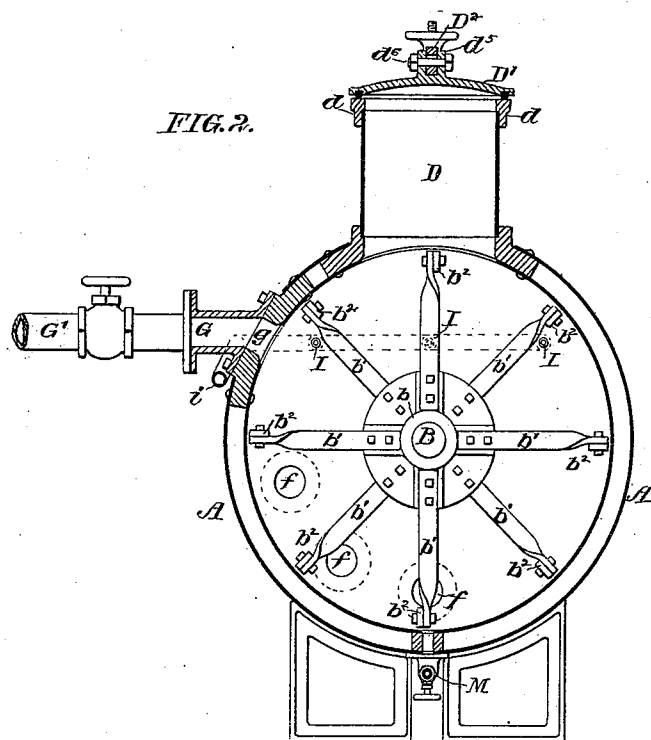
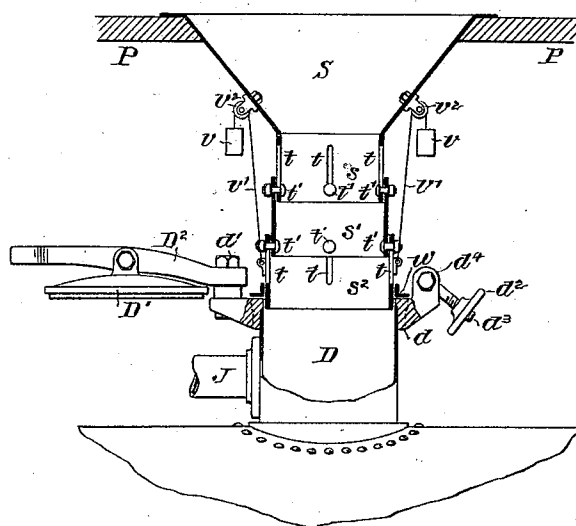
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Will. A. Barr

Inventor:
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by his Attorneys
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*FIG. 3.*

Witnesses:

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UNITED STATES PATENT OFFICE.

BENJAMIN F. HOWLAND, OF PHILADELPHIA, PENNSYLVANIA.

PROCESS OF AND APPARATUS FOR TREATING GARBAGE.

SPECIFICATION forming part of Letters Patent No. 550,270, dated November 26, 1895.

Application filed December 31, 1894. Serial No. 533,483. (No model.)

To all whom it may concern:

Be it known that I, BENJAMIN F. HOWLAND, a citizen of the United States, residing in Philadelphia, Pennsylvania, have invented certain Improvements in Treating Garbage and in Apparatus Therefor, of which the following is a specification.

The object of my invention is to provide a method and means whereby the garbage of towns and cities may be so treated as to utilize all of its valuable constituents, the process, considering the valuable character of the product, being an economical one and being carried on without the emanation of any noxious or offensive odors.

In the accompanying drawings, Figure 1 is a longitudinal section of garbage-treating apparatus constructed in accordance with my invention. Fig. 2 is a transverse section of the same on the line 2 2. Fig. 3 is a section illustrating the means employed for filling the vessel, and Fig. 4 is an enlarged view of part of the structure.

A is the cylindrical vessel having a double casing constituting a steam-jacket and provided with steam-inlet valves *a* and drain-cocks *a'*, the opposite ends of this vessel having bearings for a shaft B, which projects beyond the vessel at one end and is adapted to an outer bearing B', the shaft being provided with a spur-wheel B² of large diameter meshing with a small spur-pinion B³ on a suitable driving-shaft, so that a comparatively-slow but powerful rotating movement can be imparted to the said shaft B.

One of the bearings for the shaft B is closed and the other is provided with a stuffing-box, so that any desired degree of pressure may be maintained in the vessel A without leakage.

Secured upon the shaft B are a series of hubs *b*, each provided with a series of projecting arms, *b'* carrying at their outer ends blades *b²*, so that when the shaft B is rotated the contents of the vessel may be stirred or agitated.

On the top of the vessel A is a receiving-neck D, the upper end of which is closed by a cap D', having a packing-ring bearing upon a flange *d* at the top of the neck, so as to make a perfectly-tight joint. The cover D' is confined in place by means of a lever D², which is hung at one end to a bolt *d'* free to turn in

a lug projecting from the flange *d* of the neck D, the other end of the lever being acted upon by a nut *d²*, which is adapted to a screw-stem *d³*, pivoted to a lug *d⁴*, also projecting from the flange at the upper end of the neck D, the outer end of the lever D² being forked for the reception of said bolt.

On the back of the cover D' are lugs *d⁵* between which the lever D² fits, and these lugs carry a bolt *d⁶*, which passes through an elongated slot in the lever D², so that the cover D' is depressed by the direct action of the lever thereupon and without any strain upon this connecting-bolt, the latter simply serving to support the cover when the same is swung around out of operative position, as shown in Fig. 3.

In the bottom of the vessel A are a series of discharge-openings, two in the present instance, each of these openings being closed by a hollow plug or cap F, which is held in place by mechanism similar to that employed in connection with the cap D'. In one end of the vessel A are a series of discharge-openings *f*, three in the present instance, these openings being located at different heights and each being closed by means of a screw-plug *f'*.

On one side of the vessel A some distance below the top of the same is a tapered or flaring discharge-neck G, which communicates at the inner end with an elongated opening *g* in the casing and at the outer end with a pipe G', the latter being valved and in communication with any suitable receptacle for grease.

Projecting through each end of the casing A are a series of nozzles I, three of these nozzles being shown in the present instance at each end of the casing, although any desired number may be used. These nozzles communicate with a pipe *i*, which receives steam, air, or other fluid under pressure, and is suitably valved, so that jets can be directed inwardly from the nozzles I when desired.

With the receiving-neck D communicates a pipe J, which is intended to lead to a conveniently-located air-pump or condenser of any suitable construction.

The bottom of the vessel A is provided with a number of peculiarly-constructed duplex valves M, three of these valves being shown

in the present instance, the internal construction of each valve being illustrated in Fig. 4. Each valve communicates through a pipe m with the steam-generator and also through a pipe n with a reservoir of water under pressure, the pipe n having a check-valve n' opening toward the valve M .

In the chest of the valve m is a duplex valve-disk m' , which is adapted to close either against a seat m^2 in the chest or against a seat m^3 on the casing A , the seat m^2 being interposed between that chamber of the valve-chest which communicates with the pipe m and the chamber which communicates with the pipe n . When, therefore, the valve-disk m' is closed against the seat m^3 , access of either steam or water to the chamber within the vessel A is cut off and the pressure of steam closes the check-valve n' in the pipe n . When, however, the valve-disk m' is adjusted to the position shown in Fig. 4, steam can enter the chamber within the vessel A , the check-valve n' still remaining closed, but if the valve-disk m' is closed against the seat m^2 the inflow of steam is cut off and the water will raise the check-valve n' and enter the chamber within the vessel A .

In the floor P of a room or apartment above that in which the vessel A is located is a receiving hopper or trough S , which has a depending telescopic neck composed of three sections s , s' , and s^2 , the sections s and s^2 having slots t for the reception of bolts t' , carried by the section s' . The lower section s^2 of the telescopic neck of the hopper is connected to counterbalance-weights v by means of ropes or chains v' passing over pulleys v^2 on the hopper, and said lower section s^2 has a ring or flange w for resting upon the flange d of the receiving-neck D of the vessel A . When the vessel is receiving its load, therefore, the cover D' of the neck D is swung to one side, as shown in Fig. 3, and the telescopic neck of the hopper S is drawn down, so as to enter the neck D . The garbage is admitted into the hopper S and passes into the vessel A , being distributed therein by the slow rotation of the shaft B , with its arms and blades. During this time all of the other openings of the vessel A are closed. When the desired amount of garbage has been deposited in the vessel A , the neck of the hopper S is raised and the cover D' is swung around, so as to close the neck D , and is properly secured in place. Prior to being introduced into the vessel A the garbage is preferably moistened with sulphuric acid, or with water containing sulphuric acid, or the garbage may be first deposited in the vessel A and the acid or acidulated water subsequently introduced into the same. When the vessel has been charged and the neck D closed, the valves m' are so manipulated as to permit steam under pressure to enter the vessel A , a comparatively-high pressure—say, about seventy-five pounds to the square inch—being maintained for a period of time sufficient to thoroughly cook the gar-

bage or effect a substantially complete extraction of the grease therefrom.

When the garbage contains bones, the preliminary treatment with sulphuric acid effects the softening of these bones and permits the free extraction of grease and gelatine therefrom in the subsequent treatment. About twenty (20) pounds of acid to the ton of garbage will generally be found to be sufficient, and it will be advisable in most cases to add to the garbage some material capable of so modifying the action of the acid that while it will serve its purpose of softening the bones and freeing the grease and gelatine in the same and on the other portions of the mass it will not have an injurious action upon the metal of which the vessel is composed. I prefer to use for this purpose ground phosphate rock, which not only prevents the injurious action of the acid referred to, but also enriches the "tankage" or fertilizing material resulting from the treatment.

The quantity of phosphate rock employed should be about twice as much in weight as the sulphuric acid.

After the garbage has been sufficiently cooked by the direct action of the live steam thereupon, the valve-disks m' are moved so as to close against the seats m^2 and thus cut off the flow of steam into the vessel and permit the entrance of water into the same, if a further supply of water is necessary. This water may be cold, but it is by preference heated to a comparatively high temperature—that is to say, to a temperature approaching the point of vaporization. As the water rises in the vessel, the grease extracted from the mass of garbage floats upon the top of the water and the admission of the latter is continued until it reaches the level of the discharge-neck G . Further inflow of water is then cut off by closing the valve-disks m' against their seats m^2 , and steam or other fluid under pressure is permitted to enter the vessel through the nozzles I while the valve in the pipe G' is opened, so as to permit of the flow of the grease from said pipe and its connections into the receptacle intended for it. The jets from the nozzles I serve to direct the flow of grease from the end portions of the vessel A toward the center of the same, so that it may flow out through the neck G , the complete discharge of the grease from the vessel being thus provided for. After the grease has been discharged the flow through the nozzles I is cut off, and the water is then drawn from the vessel through the openings f at the end of the same, these openings being then closed. During the time that the garbage is being subjected to the treatment before described steam may or may not have been admitted to the hollow casing of the vessel A ; but after the draining of the water from the vessel steam is admitted to this casing, if it had not before been admitted thereto, and at this time the pipe J is put in communication with the air-pump or condenser, so as to cre-

ate a partial vacuum within the vessel in order to effect the rapid drying of the contents of the vessel.

While the garbage is being subjected to the action of the live steam, it is advisable to stir or agitate the mass by the slow rotation of the shaft B with its arms and blades, and the mass is likewise agitated during the drying operation, the rotation of the shaft B in the latter case being, by preference, considerably faster than during the cooking operation.

When the mass within the vessel A has been properly dried, the caps or plugs F are removed from the openings in the bottom of the vessel and the dried mass is discharged through these openings, the continued rotation of the shaft B with its arms or blades being all that is necessary to effect a practically-complete discharge of the dried mass, which may be conveyed to any suitable form of mill for the purpose of being ground or pulverized in order to render it available as an efficient fertilizing material.

As no expensive chemical agents are necessary in the treatment of garbage in accordance with my invention, and as all of the garbage, excepting the water therein, is saved in such form as to have a commercial value, and no skilled labor is required at any stage of the operation, the process is an extremely-economical one, while, owing to the fact that the treatment is effected in a hermetically-sealed vessel, no escape of noxious or offensive gases is possible. Hence the apparatus can, without objection, be erected at a central point or points in a city or town and long hauls of the garbage thereby rendered unnecessary.

Although I prefer to use the form of duplex valve which I have illustrated and described, it will be evident that independent valves for the steam and water may be used, if desired, and also that various forms of stirring or agitating devices may be employed without departing from the essential features of my invention.

Having thus described my invention, I claim and desire to secure by Letters Patent—

1. The mode herein described of treating garbage, said mode consisting in first extracting the grease from the garbage in a closed vessel, floating the grease to the upper por-

tion of the vessel, directing the grease toward a central discharge by the action of steam jets, withdrawing the grease therefrom, draining off the water and drying the remaining mass by the application of heat, substantially as specified.

2. The mode herein described of treating garbage, said mode consisting in first subjecting to an acid treatment the garbage combined with material for preventing injurious action of the acid upon the metal of the heating vessel, then subjecting said acid-treated mass in such vessel to the action of steam under pressure to effect the extraction of the grease, cutting off the steam, floating the grease into the upper portion of the vessel, directing the grease toward a central discharge, withdrawing the grease therefrom, draining off the water, and drying the remaining mass, substantially as specified.

3. The mode herein described of treating garbage, said mode consisting in first mixing the garbage with acid and with ground phosphate rock, then subjecting the mass in a closed vessel to the action of steam under pressure to effect the extraction of the grease, cutting off the steam, floating the grease into the upper portion of the vessel, directing the grease toward a central discharge, withdrawing the grease from said upper portion of the vessel, draining off the water, and drying the remaining mass, substantially as specified.

4. The combination of the treating vessel having a centrally located discharge neck for the grease, with end nozzles, and means for supplying steam or other fluid under pressure thereto so as to direct the grease toward the center of the vessel, substantially as specified.

5. The combination of the treating vessel, with the valve having a chest with steam and water chambers and two seats one of which is interposed between the steam chamber and the water chamber, a duplex valve disk, a steam supply pipe and a water supply pipe having a check valve opening toward the chest of the valve, substantially as specified.

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

BENJAMIN F. HOWLAND.

Witnesses:

WILL. A. BARR,
JOSEPH H. KLEIN.