

Sept. 17, 1935.

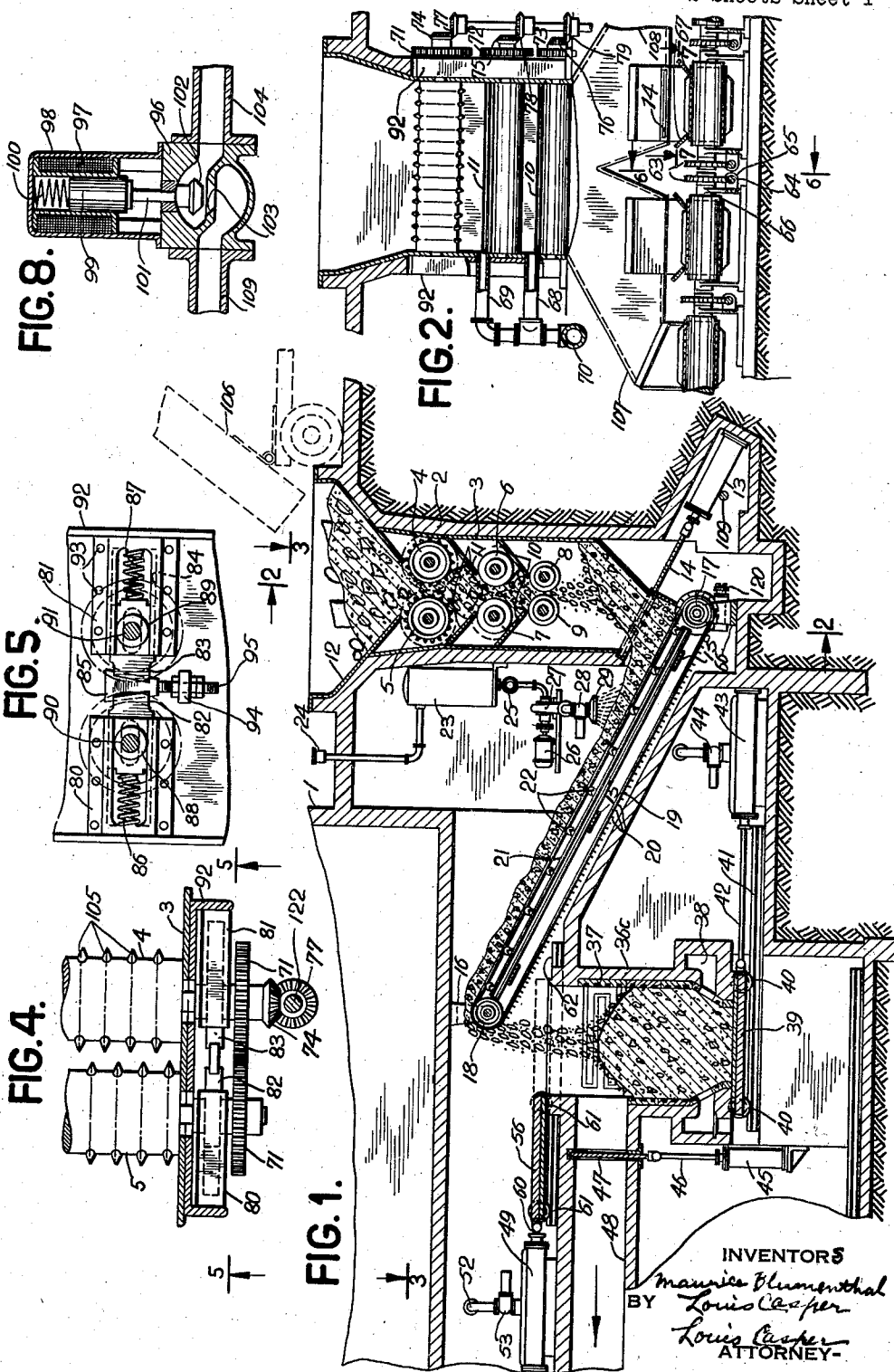
M. BLUMENTHAL ET AL

2,014,796

SYSTEM FOR THE DISPOSAL OF GARBAGE AND THE LIKE

Filed Dec. 9, 1932

2 Sheets-Sheet 1



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SYSTEM FOR THE DISPOSAL OF GARBAGE AND THE LIKE

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2 Sheets-Sheet 2

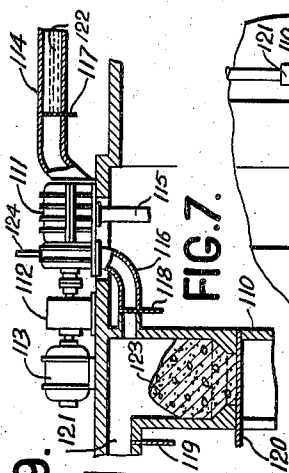


FIG. 7.

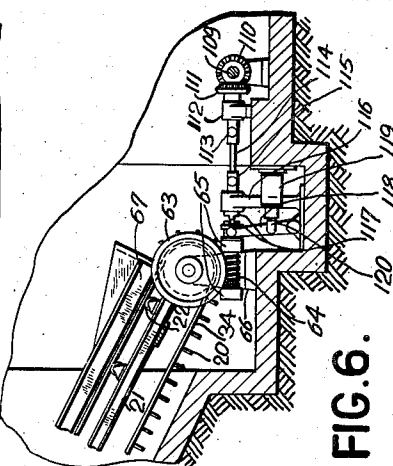
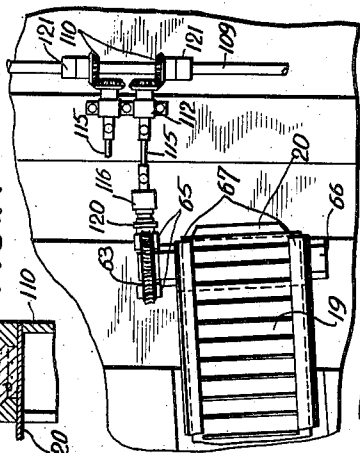


FIG. 6.

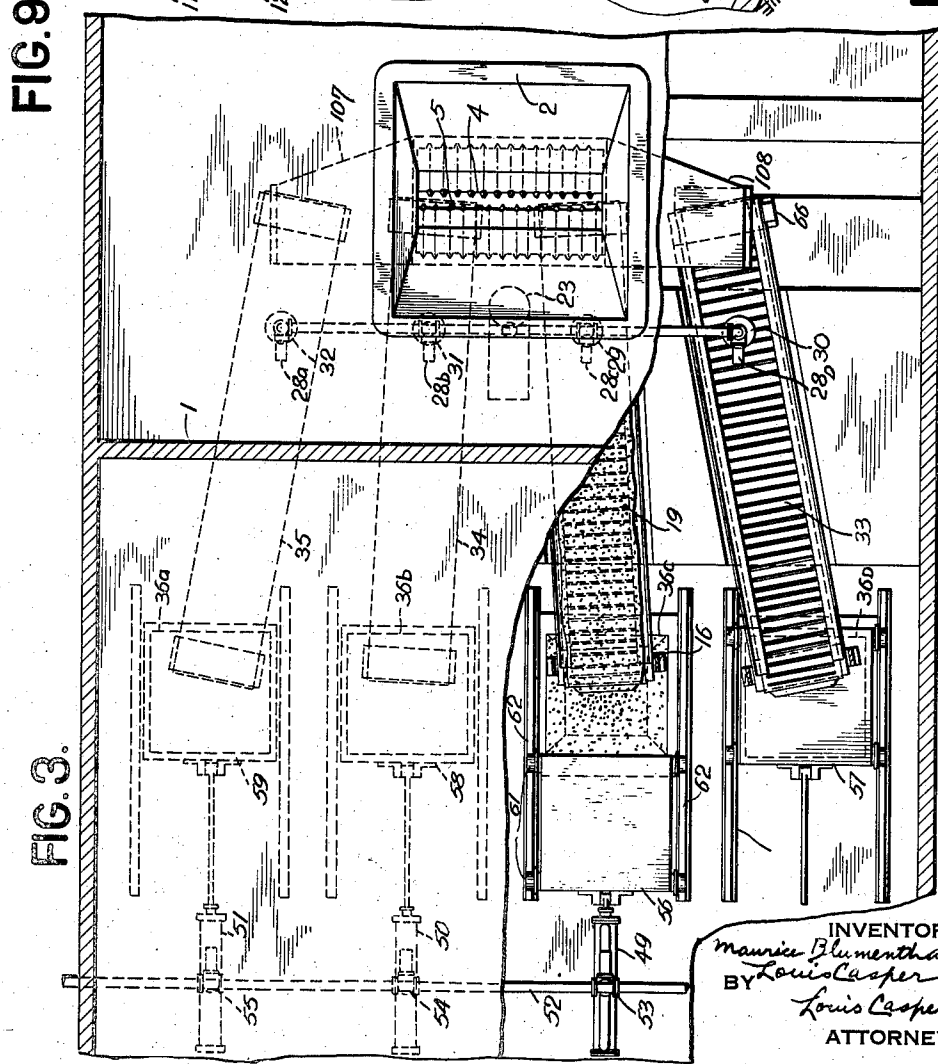


FIG. 3.

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2,014,796

SYSTEM FOR THE DISPOSAL OF GARBAGE
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Application December 9, 1932, Serial No. 647,970

11 Claims. (Cl. 110-9)

The object of our invention is to provide a system whereby garbage or other refuse materials may be disposed of by incineration, but preliminary to such incineration, certain chemical sprayer and dewatering means are provided to treat the garbage or other refuse materials aforesaid, resulting in a speeding up of such disposal and also to effect certain economies in the incinerating process.

A further object of our invention is to make it possible to conserve the by-products obtainable from garbage or the like prior to its actual incineration, also to conserve such material during the incinerating process; and likewise after such incineration shall have been completed.

Our invention pertains particularly in connection with our application for patent, Serial No. 5,830, filed February 9, 1935 to which it is subject.

In connection with the foregoing objects of our invention, a number of features in reference to the disposal of garbage and other refuse material by electrical incineration was not disclosed in our previous application. These features will now be described and such description forms substantially the basis of the present application.

The first of these features relates to the moisture content usually present in garbage and other refuse and waste materials. It is generally desirable to eliminate as far as practicable the aforementioned moisture prior to the depositing of such waste materials in an electrical incinerating chamber. This is attained in the first instance by providing a series of grinding and dewatering rollers which squeezes out the moisture as the garbage or other waste materials are passed between the rollers aforesaid.

And second, in the event the waste materials to be disposed of consist of colloidal solids in liquid suspension, such as is constituent in sewage or slaughter house wastes, it is necessary to employ means for dewatering said materials other than maceration or treatment by squeezing rollers. In that event, a device well known to the art as a "centrifuge" or machine for the continuous separation of solids from liquids, is employed.

Following the dewatering process, the next step in our invention is the preparation of the waste materials prior to the deposit of the same into the electric incinerator chamber or chambers. This preparation consists of spreading upon the waste materials and intermingling therewith a chemical or chemical combination of low relative cost and which possesses a relatively high elec-

trical conductivity and which also readily mixes with the refuse mass. The mixed mass aforesaid offers considerably less resistance to an electrical current flow than what would obtain if such materials had merely been dewatered by the process as stated.

When the chemically treated waste materials shall have been deposited in the incinerator chamber or chambers, and with the outer area of the mass in direct contact with electrodes set in the inside walls of said chamber or chambers, it is possible to transmit a network of electric currents of sufficient values through and across said deposited mass to create an incandescence of the mass and its eventual incineration.

The disintegrating effects of the electric current flow as stated, combined with the transfer of radiant heat to the outer area of the refuse mass through heat conduction from the electrodes aforesaid; and also heat conduction from the refractory walls in which said electrodes are embedded, result in an accelerated and efficient process of incineration of the refuse mass, especially the central portion thereof in the chamber aforesaid.

The system preferably utilized in practicing our invention is shown in the accompanying drawings in which like reference numerals are employed to designate similar parts throughout the several figures, and, in which, Fig. 1 is a general longitudinal view of the incineration and disposal system, including the combined grinding and dewatering rollers and garbage conveyors.

Fig. 2 is a section on a line 2-2 of Fig. 1 showing in section the combination grinding and dewatering rollers and also an end view of the garbage conveyors.

Fig. 3 is a plan view of Fig. 1 partly in section showing portions of the garbage conveyors and with the incinerator chamber entrance in an open position to receive garbage material.

Fig. 4 is a detail view of the grinding and dewatering rollers and driving means therefor.

Fig. 5 is a view on a line 5-5 of Fig. 4 showing the side tension springs of the rollers, 4, 5.

Fig. 6 is a sectional view on a line 6-6 of Fig. 2 showing the driving means for the conveyors.

Fig. 7 is a sectional plan view on a line 7-7 of Fig. 2.

Fig. 8 is a sectional view of an automatic valve used in connection with the chemical spraying apparatus shown in Fig. 1.

Fig. 9 is a sectional view of the dewatering,

incinerating and chemical elements used in connection with sewage disposal.

Referring specifically to Fig. 1, 1 is an outline of the housing structure enclosing the garbage incineration system. 2 as a whole is the garbage dewatering and grinding chamber. 3 is the inside shell or wall thereof. 12 is the tapered inner shell at the top of chamber 3. 4, 5 are the upper dewatering and grinding rollers. 6, 7 are the intermediate dewatering rollers. 8, 9 are the lower dewatering rollers. 10, 11 are partitions situated anglewise below the grinding and dewatering rollers 6, 7. These partitions serve the double purpose of properly directing the garbage toward the bottom of the chamber 2, and also to divert the squeezed out liquid from the garbage into the piping system comprising pipes 68, 69 and 70. 13 is a steam plunger which operates the shutter or gate 14, which when opened by the plunger aforesaid, permits the garbage or the like to fall on to the conveyor belt 19. The conveyor belt 19 moves on rollers 22 which roll on and are supported by platform 21. This platform in turn is supported by bars 15 which are secured to the wall of the structure 1. 16 is a hanger support for the upper conveyor roller 18. 17 is the lower conveyor roller supported by bearing 66. Affixed upon the conveyor belt 19 in equidistant positions are upright strips 20. These strips serve to hold the garbage upon the conveyors after it has been discharged thereon from the chamber 2.

A storage tank 23 is employed for storing certain chemicals that have the property of being relatively good conductors for the flow of an electric current, such as calcium chloride, ferric chloride, or similar chemical combinations and which is sprayed or combined with either the ground and dewatered refuse; or with dewatered sewage or other colloidal materials for the purpose of rendering the mixture a partial conductor of electric current as stated. 24 is the supply valve for the tank 23. 26 is an electric motor that operates the pump 27, the latter being used to pump out the chemical compound or fluid stored in chamber 23 through the automatic valve 28 (hereinafter to be described) and outward through the spray nozzle 29.

Over the opening of the incinerator chamber 36 a gate 56 is provided. This gate moves on wheels 61 which roll upon rails 62. The gate 56 is operated by steam or pneumatic plunger 49 and is controlled through the automatic valve 53 which permits steam or air pressure to flow into the plunger from the steam or air pipe 52. 39 is a lower gate to provide a means for the discharge of incinerated residue. This gate has wheels 40 which operate on rails 41. The movement of this gate is controlled by the steam or pneumatic piston or plunger 43 controlled through the medium of valve 44. A gas outlet 48 is provided for the incinerator 36. The gas flow is controlled by valve 47. This valve is operated by steam or pneumatic plunger 45. The gates aforesaid may be electrically operated as disclosed in our pending application Serial No. 5,830 filed February 9, 1935.

Referring to Fig. 3 which is a sectional plan view of an incinerator plant. 107, 108 are dispensing bins to provide means to distribute garbage to the several conveyors such as 33, 34 and 35. Each of the bins are provided with shutter valves similar to valve 14 shown in Fig. 1. Similarly, chemical sprayers are provided to treat garbage or other refuse material that is passing

along the respective conveyors while they are in motion.

The sprayers 29, 30, 31, 32 receive a supply of calcium chloride or similar chemical for the purpose intended from the supply tank 23 through the medium of a supply pipe, and each sprayer is individually controlled by automatic valves 28^a, 28^b, 28^c, 28^d respectively.

The garbage or similar waste material is dumped into incinerator chambers 36^a, 36^b, 36^c, 36^d. Each of the chambers are provided with gates 56, 57, 58, 59. The inner walls of said chambers are provided with exposed looped resistor ribbons or electrodes embedded in said inner walls. A full detail of said incinerator chambers is given in pending application for patent Serial No. 5,830, filed February 9, 1935. The gate over incinerator chamber 36^c is in an open position while the three other gates as shown in Fig. 3 are in closed positions. 52 is the connecting steam or pneumatic pipe. 53, 54, 55 are the automatic valves controlling pistons 49, 50 and 51 which operate their respective incinerator gates. The opening leading into dewatering and incinerating chamber 2 can be seen in Fig. 3 into which the garbage is initially dumped.

In Figs. 4 and 5 is shown the method in which the grinding and dewatering rollers 4, 5 are operated. 71 are connected gears which are driven through journal 74, the end of which being provided with a bevel gear that engages with bevel gear 77. This latter gear is mounted on a shaft that is driven by a prime source of power which may be either from a steam engine or an electric motor. The dewatering rollers 11, 10 (Fig. 2), 35 are also provided with gears 72, 73 respectively, which are driven through the medium of bevel gears 76, 78 by the power shaft aforesaid.

Between the grinding and dewatering rollers 4, 5, a spreader 85 is placed which is held in position by a threaded bearing 94. The spreader is adjustable by means of the set screw and lock-nuts at 95. The grinding rollers 4, 5 press resiliently against the spreader 85. This resilient movement of the rollers aforesaid is attained by means of coiled springs 86, 87 which press against slidable members 82, 83 set in frames 80, 81. When large masses of refuse material are thrown against the grinding rollers, the rollers are forced apart which is possible because the journal of each roller is provided with an elongated bearing as shown at 90, 91 which permits freedom of movement of the rollers away from the spreader 85 and against their respective coiled springs 86, 87. 92 is the supporting frame for the rollers, 93 are fastening rivets to secure the bars that hold the slidable members 82, 83 in their respective grooves.

Referring to Figs. 6 and 7. In these figures a portion of the conveyor 34 is shown. The conveyor is driven by sprocket wheel 63 which in turn is driven by worm gear 64 set in bearings 65, 66. Attached to the worm gear is clutch 117 which connects with flexible shaft 114 when thrown to the right by shift rod 118, the latter controlled by connecting rod 120. This rod forms a section of the armature of solenoid 119 that controls the aforesaid shift rod. 110 is a bevel gear attached to main driving shaft 109. This shaft is operated by power means which may be a steam engine or electric motor. When the solenoid 119 is energized, the clutch 117 is thrown in operative contact with the shaft 114 which is operated by the main shaft 109 through the me-

dium of bevel gears 110 and 111. The shaft 114 is connected up with flexible links 113, 115. This shaft is supported in bearings 116 and 112.

The necessity for the flexible links is apparent in the fact that the conveyors are fixed in angle-wise positions so that they may center at their initial loading sections contiguous to the dumping chamber 2 and terminate over the respective incinerator chambers as shown in Fig. 3. A portion of the link 115 is shown in Fig. 7 which is actually attached in a manner similar to flexible link 113 in Fig. 6.

Referring to Fig. 8 which is a typical electrically operated automatic valve. This valve is used in connection with the chemical sprayer arrangement detailed in Fig. 1. This valve is also used in connection with the control of pistons 49, 50, 51 which are shown at 53, 54, 55 (Fig. 3). 98 is the valve shell; 97 is the solenoid coil; 99 is the solenoid plunger armature; 102 is the valve thereof; 103 is the valve seat; 104 is the inlet pipe and 109 the outlet pipe. One automatic valve for each conveyor is provided and each valve is connected in the chemical feed pipe and automatically controls the flow of chemical material or fluid intended for spraying the garbage. When any conveyor or conveyors are not operating, the automatic valve shown in Fig. 8 will automatically shut off the chemical supply for that particular conveyor or conveyors; and, likewise, whenever any conveyor is in operation, the automatic valve for such conveyor or conveyors will open, thereby permitting the proper spraying of the garbage as already explained.

The operation of the garbage incineration system is as follows:

The garbage is dumped into the receiving chamber 2 by the truck 106. The garbage falls against the grinding and dewatering rollers 4, 5. The excess water from the garbage is drawn off into pipe 69. The garbage next falls between the rollers 6, 7, and the excess water caused by squeezing of the garbage against the rollers aforesaid is drained off pipe 68. The garbage then falls between rollers 8, 9, after which it falls on to the conveyor belt 19, provided the shutter valve 14 is open. The garbage by this time has yielded a large percentage of its moisture content thus making it easier of incineration and the grinding process has also rendered the garbage more susceptible of chemical treatment rendering the garbage material less resistant to electric current flow therethrough.

As already stated by rendering garbage or other refuse materials a partial conductor at least of electric current, two distinct advantages are gained. First, the incinerating process is accelerated by a flow of current through the garbage mass causing direct heating of the same through electric conduction. Otherwise the preliminary heating of the mass would have to start from the heated resistor ribbons radiating the heat to the garbage in the immediate vicinity of such resistor ribbons or electrodes and gradually heating the mass through heat conduction. Second, by having a less electrical resistant material to be incinerated, it is possible to obtain a higher current value per unit of electrical energy introduced into the incinerating chambers. It is recognized that the higher the current the more susceptible the mass becomes to incandescence and more readily the incineration of the mass aforesaid; provided of course, and in accordance with Ohm's law the resistance of the mass to electric current flow is comparatively low.

After the garbage has been chemically treated, it is moved into the incinerator chamber, and when the chamber is filled, the upper door or gate 56 is closed by the operator through the operation of piston or plunger 49. The current is then switched on and the electrolyzing process begins, air being supplied to the chamber through manifold 38 to promote complete combustion. When incineration is complete, the lower door or gate 39 is opened and the residue falls into a receptacle or vehicle beneath the incinerator chamber.

Each conveyor of the type similar to conveyors shown at 33, 34, 35, is separately controlled so that if the upper gate or door of a certain incinerator is closed, the loading conveyor pertaining to that particular chamber is shut off, and likewise the valve 14 corresponding to the bin that feeds the conveyor aforesaid is closed.

In the event that it is desired to load any particular incinerator chamber, the upper door or gate is opened, the conveyor leading to that particular chamber is set in motion. The shutter valve 14 is opened releasing the garbage which then falls on to the conveyor aforesaid. The chemical sprayer pertaining to that particular conveyor is started in operation spraying the garbage as it passes the sprayer arrangement. When the incinerator chamber is loaded, the door or gate is closed, and the conveyor movement is stopped, and likewise the chemical sprayer is automatically cut off.

In Fig. 9 is shown an adaptation of the present invention for sewage disposal. The sewage 122 passes through pipe 114 and is controlled by valve 117, which, when opened permits the sewage to flow into centrifuge 111. The centrifuge or centripetal separator is well known in the art as a machine for the continuous separation of solids from liquids and is fully described in the following and other patents: 1,572,611 Feb. 7th, 1926, 1,572,612 Feb. 9th, 1926, 1,710,316 Apr. 23rd, 1929, 1,885,735 Nov. 1st, 1932.

The mixed solids and liquids are rapidly revolved inside the centrifuge which is operated by motor 113, the armature of which is shafted to the centrifuge through bearing 112. The liquid that is separated from the sewage in the centrifuge passes through pipe 115. The solids pass through pipe 116 into incinerator chamber 110 shown at 123.

The chemical treatment of the sewage is similar to spraying methods described heretofore and is performed in pipe 116. This renders the dewatered sewage solids less resistant to electric current flow which hastens incineration.

The electric incinerator 110 as shown in Fig. 9 is similar in detail and construction to the chamber 36 shown in Fig. 1, except that the upper section thereof has no moving gate, the discharge of sewage solids into the chamber 110 is made through the pipe 116, the sewage solids having been dewatered and treated chemically prior to the delivery of the same through the pipe aforesaid.

A valve 118 controls the flow of solids through the pipe 116 aforesaid. 121 is the gas outlet of the incinerator 110, and 119 is the valve controlling the flow of gas through said gas outlet. 120 is the lower or discharge gate. 124 is the gas take-off for the centrifuge 111.

It will be seen that this system is capable of considerable modification without departing from the spirit of the invention. The dewatering and grinding of garbage may be accomplished by a

system of presses operating on receiving pans which are provided with drain pipes to draw off liquids resulting from such pressure. The pans aforesaid may also be used as conveyors to finally deposit the refuse materials into the incinerators. The waste material may also be conveyed to the incinerators by buckets.

As stated in the specification of our previous application for patent, the heated gases flowing through gas outlets of the incinerator chambers are capable of utilization such as heating a boiler or battery of boilers for the making of steam. In the present invention the heated gases coming from the incinerator chambers, are more constant and tend to have higher temperatures. This is due to the accelerated incineration of refuse materials, first, because of the chemical treatment of refuse materials prior to being loaded into the incinerator chambers and, second, to dewatering and grinding the refuse materials.

The chemical treatment of garbage or refuse may result in the chlorination of the material. Chlorination of refuse and sewage is not new. The chemical treatment as described in this specification is for the purpose of better preparation of the refuse materials for electrical incineration; and should chlorination result therefrom, such result is purely incidental to the main purpose of chemical treatment of refuse materials. It may be stated, however, that such incidental chlorination is desirable although not an essential factor to our invention.

The liquid coming from dewatered garbage or from sewage freed from excess liquid is utilizable by well known methods for the extraction of such materials as ammonia, glycerine, oils, and so forth.

Now having described our invention what we claim is—

1. In a system for the disposal of garbage, sewage or other waste materials, an incinerator chamber having electric heating and electric contacting means exposed therein; means for dewatering said waste materials; means for conveying said materials from said dewatering means to said incinerator chamber; and means for treating said waste materials with chemicals or chemical combinations thereof that have the property of rendering said waste materials susceptible to electric current flow, said treatment being performed after said waste materials shall have been dewatered and prior to being deposited into the incinerator chamber aforesaid.

2. In a system for the disposal of garbage, sewage or other waste materials, an incinerator chamber having electric heating means exposed therein; means for dewatering said waste materials; means for conveying said materials from said dewatering means to said incinerator chamber; and means for treating the same with calcium chloride, ferric chloride or like chemicals which render said waste materials susceptible to electric current flow, said treatment being performed after said waste materials shall have been dewatered and prior to being deposited into the chamber aforesaid and electrical contacting means in said chamber.

3. In a system of the class described having an incinerator chamber; means for dewatering waste materials to be deposited into said chamber; means for treating said waste materials chemically for the purpose of rendering the same a partial conductor of an electric current, said treatment being performed prior to the deposit of said waste materials into said chamber; means for

conveying said material from said dewatering means to said incinerating chamber; contacting and heating electrode means within said chamber which convey electric current that flows through said chemically treated waste materials for the purpose of causing an incandescence to the mass; and in addition thereto said contacting and heating electrode means conveying radiant heat by means of heat conduction upon the outer area of the mass of waste materials that have been deposited within the chamber aforesaid.

4. In a system for the disposal of refuse materials or the like; a main receiving chamber; grinding and dewatering means built in said receiving chamber; a controllable shutter for the discharge of said receiving chamber; an incinerator chamber having exposed electrical contacting means therein; conveyor means to transfer said refuse materials to said incinerating chamber after said refuse shall have been released by the opening of the shutter aforesaid; a controllable top door for said incinerating chamber which opens to permit the reception of the refuse materials therein; and a lower door to permit the discharge of said refuse materials after the incinerating process shall have been completed and means for chemically treating said refuse materials to render the same a partial conductor of electric current before the incinerating process.

5. In a system for the disposal of refuse materials or the like; a main receiving chamber; grinding and dewatering means built in said receiving chamber; means for chemically treating said refuse materials so as to render the same susceptible to the flow of an electric current; an incinerator chamber having exposed electrodes on the inner surface thereof; and conveyor means to transfer said refuse materials to said incinerator wherein said electrodes contact with said treated refuse materials.

6. In a system for the disposal of refuse materials or the like; a main receiving chamber; grinding and dewatering means built in said receiving chamber; a controllable shutter for the outlet of said receiving chamber; a series of incinerator chambers having exposed electrical contacting means therein; conveyor means to transfer said refuse materials to said series of incinerator chambers after said refuse materials shall have been ground and dewatered, and after having been released by the opening of the shutter aforesaid; a controllable door for each of the said series of incinerator chambers which opens to permit the reception of the refuse materials therein; and a lower door for each of the series of incinerator chambers to permit the discharge of said refuse materials after the incinerating process shall have been completed and means for chemically treating said refuse materials to render the same a partial conductor of an electric current before the incinerating process.

7. In a system for the disposal of refuse materials or the like; a main receiving chamber; grinding and dewatering means built in said receiving chamber; a controllable shutter for the outlet of said receiving chamber; means for chemically treating the mass of said refuse materials for the purpose of rendering said mass susceptible to the flow of an electric current after the same shall have been ground and dewatered; an incinerator chamber having exposed electrodes on the inner surface thereof; conveyor means to transfer the aforesaid treated refuse materials to said incinerator chamber wherein said electrodes contact with said treated

refuse materials; and means for permitting the discharge of said refuse materials after the incinerating process shall have been completed.

8. In a system for the disposal of refuse materials or the like; a main receiving chamber; grinding and dewatering means built in said receiving chamber; means for treating by means of chemicals the mass of said refuse materials for the purpose of rendering said mass susceptible to the flow of an electric current after said mass shall have been ground and dewatered; an incinerator chamber having exposed electrodes on the inner walls thereof; conveyor means to transfer the aforesaid treated refuse materials to said incinerator chamber wherein said electrodes contact with said treated refuse materials within the chamber aforesaid; storing means for said chemicals contiguous to said conveyor means; and valve means attached to said storing means for controlling the flow of said chemicals during the process of treating said refuse materials prior to depositing the same into the incinerator chamber aforesaid.

9. In a system of the class described; a sewage conduit; a centripetal machine, the centrifuge of said centripetal machine piped in connection with said conduit to dewater sewage or the like entering through said conduit; valve means to control the flow of sewage in said conduit; an orifice in connection with said centrifuge, means associated with said orifice for chemically treating said dewatered sewage so as to render said sewage or the like a partial conductor to the flow

of an electric current, an incinerator having electrically heated and contacting electrodes within the same to contact with dewatered and chemically treated sewage or the like for causing an electric current to flow across and through said deposited sewage or the like and resulting in the incandescence and final incineration thereof; means for conveying the sewage solids from said centrifuge to said incinerator; and means for permitting the discharge of said sewage or the like after the incinerating process shall have been completed.

10. In a system for the disposal of garbage, sewage or other waste materials, an incinerator chamber having electric heating and electric contacting means exposed therein; means for conveying said material to said incinerator chamber, and means for treating said waste material with electro conductive chemicals prior to entry in said incinerator chamber.

11. In a system for the disposal of garbage, sewage or other waste materials, the method of promoting incineration which comprises adding electro conductive chemical materials to said waste materials, disposing said combined materials in a chamber, passing an electric current through the body of combined materials to heat the materials to a combustible temperature and directing a blast of air into the body of materials being heated to produce complete combustion of the combustible contents thereof.

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