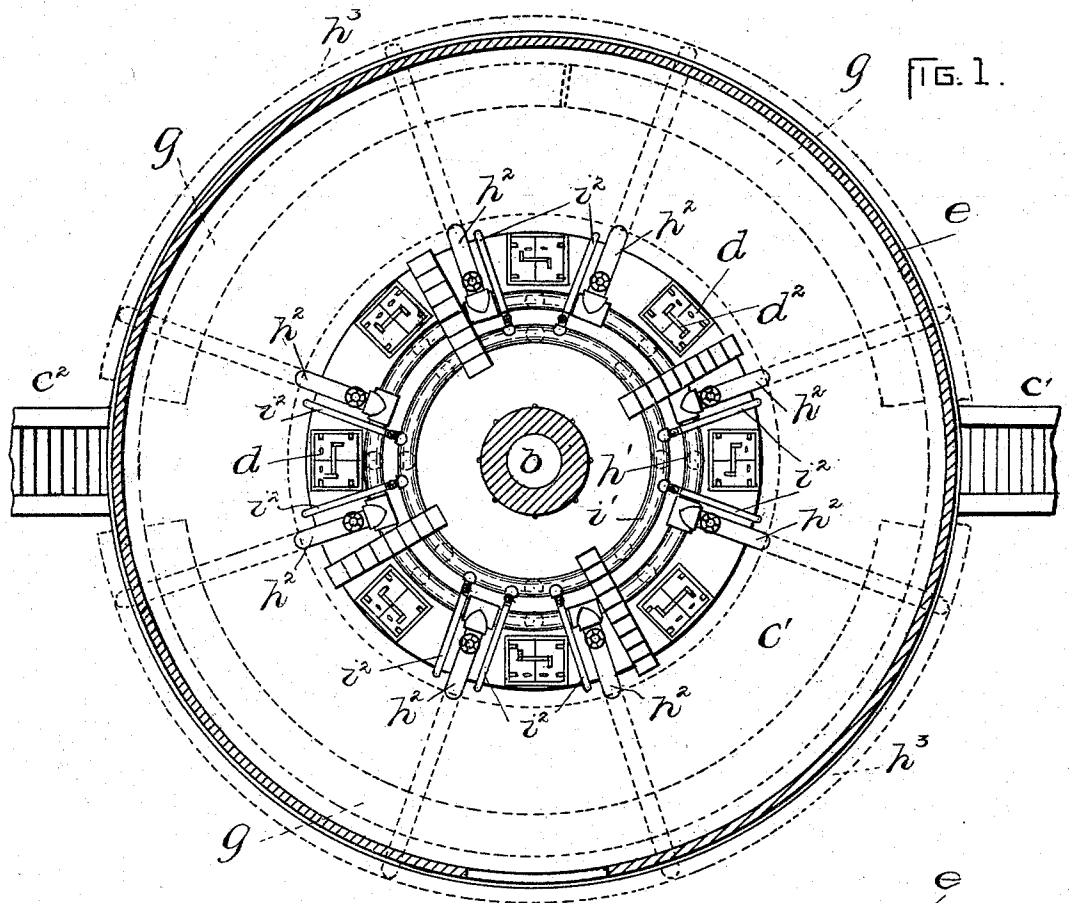
(No Model.) 5 Sheets—Sheet 1.

T. M. CLARK.

APPARATUS FOR CREMATING GARBAGE.

No. 526,516. Patented Sept. 25, 1894.



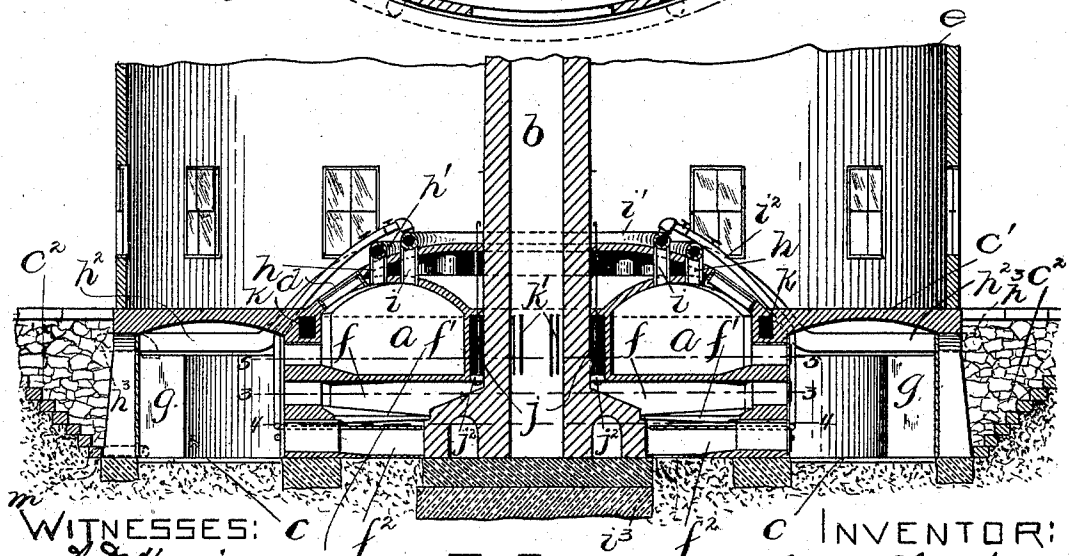


FIG. 2.

WITNESSES:
A. D. Harrison
Parker Davis

INVENTOR:
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Attys.

(No Model.) 5 Sheets—Sheet 2.

T. M. CLARK.

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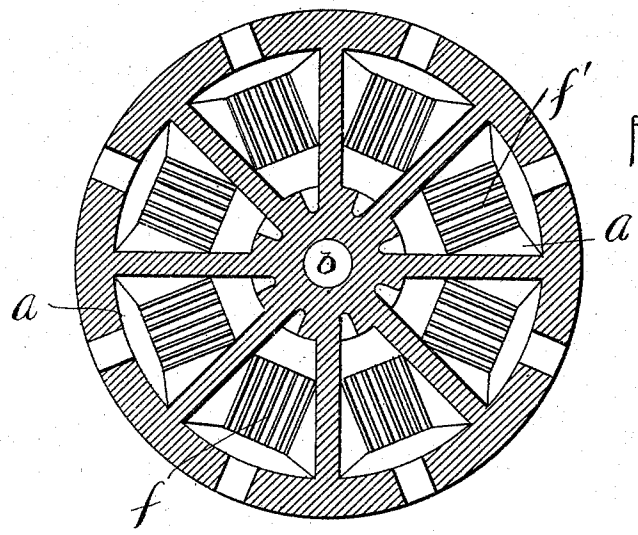

FIG. 3.

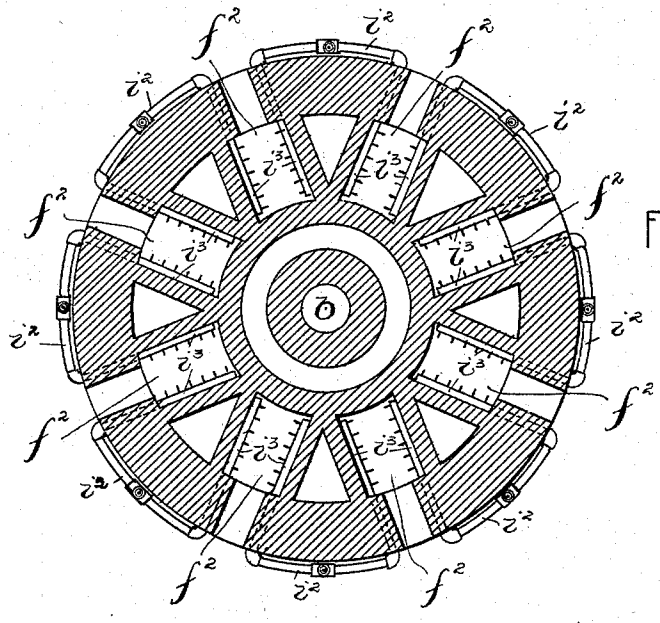

FIG. 4.

WITNESSES:
A. D. Harrison
Baker Davis

INVENTOR:
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(No Model.) 5 Sheets—Sheet 3.

T. M. CLARK.

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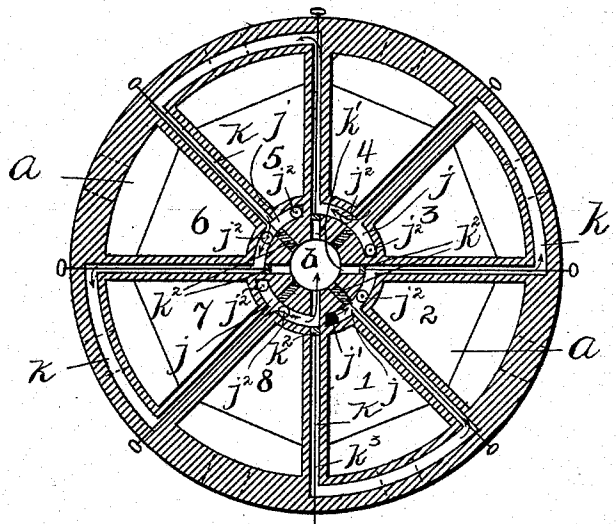
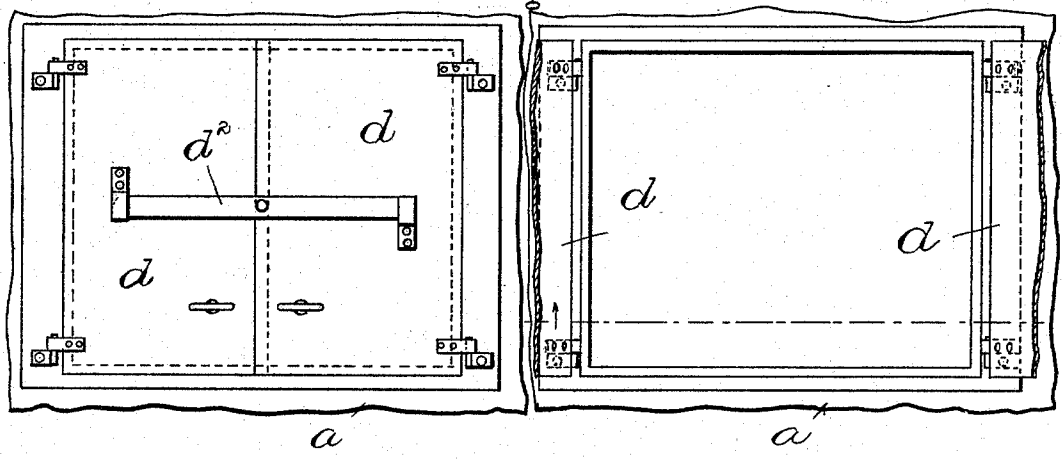


FIG. 5.

FIG. 6.

FIG. 7.



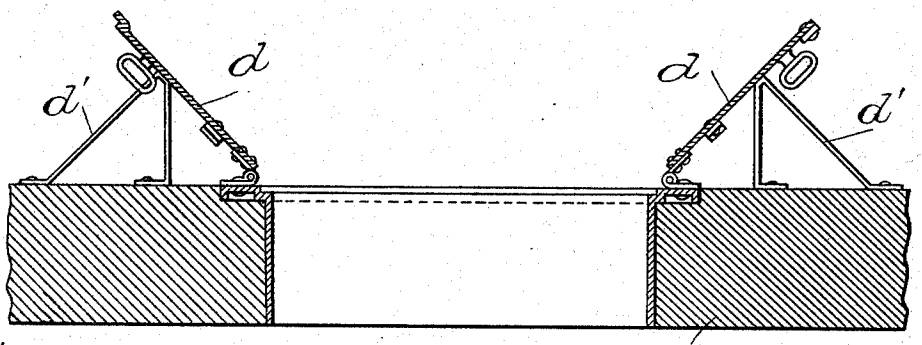


FIG. 8.

WITNESSES:
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INVENTOR:
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(No Model.) 5 Sheets—Sheet 4.

T. M. CLARK.

APPARATUS FOR CREMATING GARBAGE.

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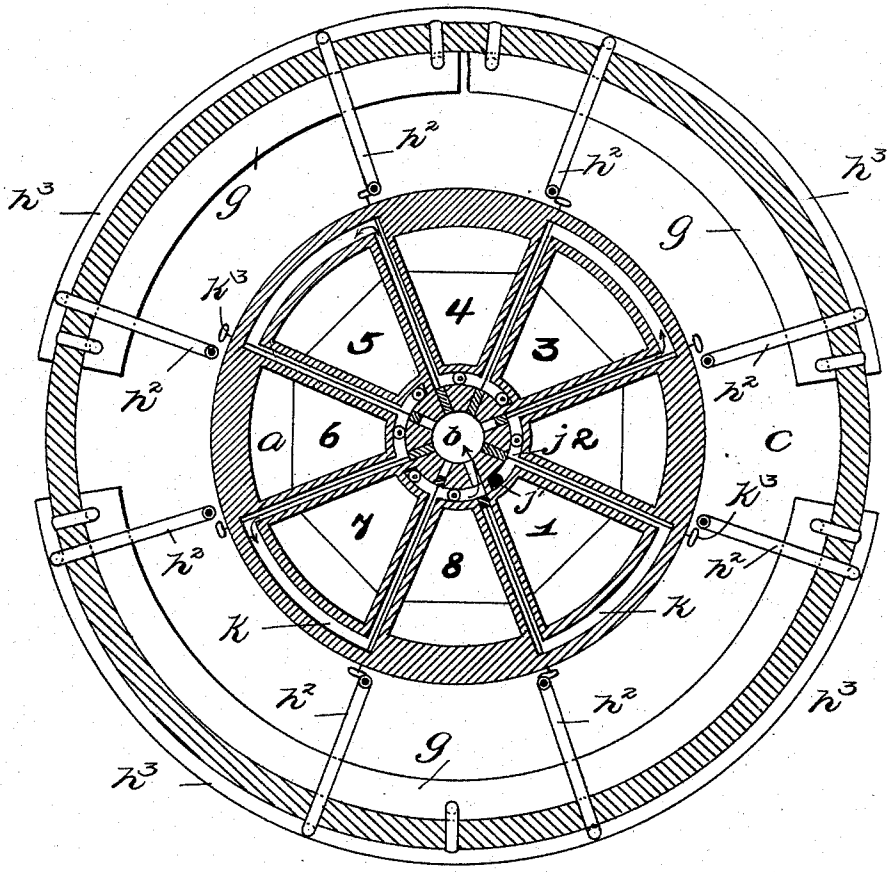

FIG. 9.

WITNESSES:
H. D. Harrison
Robert Davis

INVENTOR:
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(No Model.) 5 Sheets—Sheet 5.

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APPARATUS FOR CREMATING GARBAGE.

No. 526,516. Patented Sept. 25, 1894.

FIG. 10.

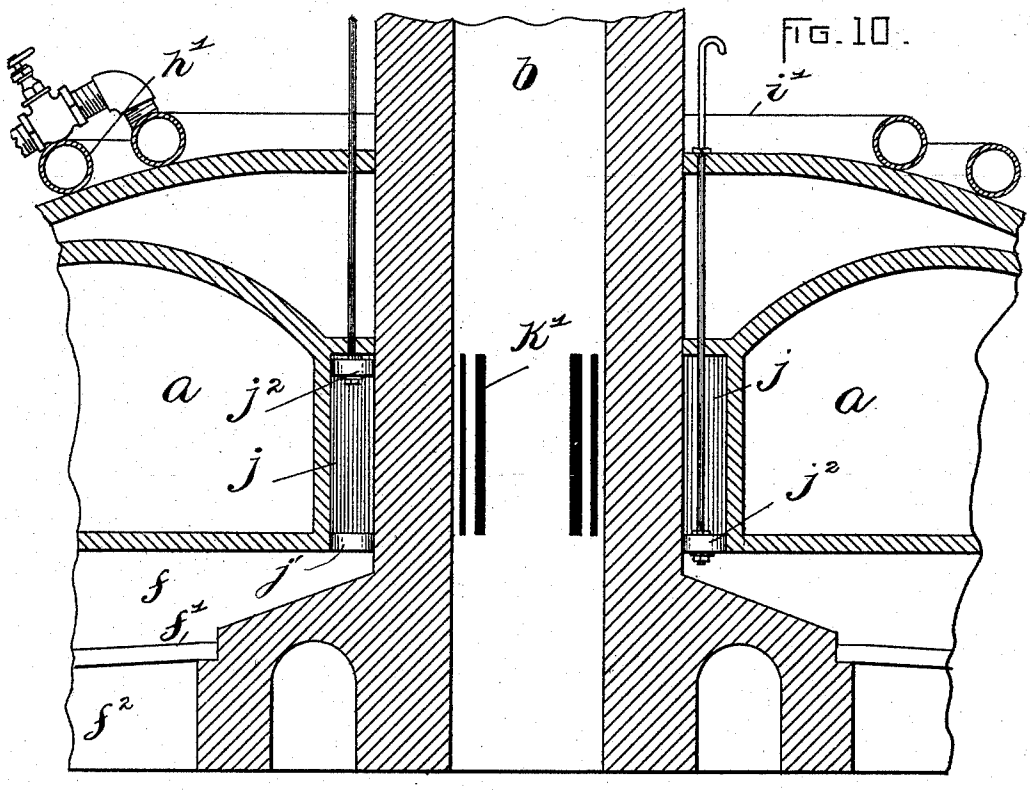
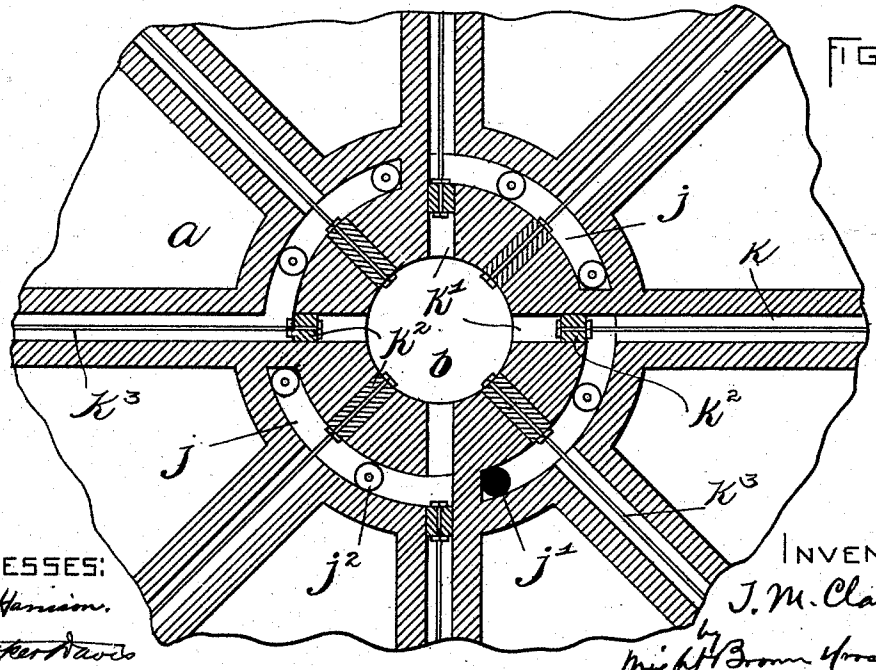


FIG. 11.



WITNESSES:
H. D. Harrison.
Parker Davis

INVENTOR:
J. M. Clark
by Wright Brown Quinby & Atty's

UNITED STATES PATENT OFFICE.

THEODORE M. CLARK, OF NEWTON, MASSACHUSETTS.

APPARATUS FOR CREMATING GARBAGE.

SPECIFICATION forming part of Letters Patent No. 526,516, dated September 25, 1894.

Application filed July 13, 1893. Serial No. 480,389. (No model.)

To all whom it may concern:

Be it known that I, THEODORE M. CLARK, of Newton, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Apparatus for Cremating Garbage, of which the following is a specification.

This invention relates to an improvement in apparatus for cremating garbage, the object being to provide for more conveniently and economically disposing of garbage, and extracting therefrom marketable products, such as alcohol and acetic acid, and also utilizing hydrocarbon gas disengaged from the garbage as fuel to supply heat for carrying on the process.

The accompanying drawings illustrate the invention.

Figure 1 shows a plan of a plant constructed in accordance with the invention. Fig. 2 shows a vertical cross-section of the same. Figs. 3, 4 and 5 show sections on lines 3—3, 4—4 and 5—5 of Fig. 2. Figs. 6, 7 and 8 show detail views of the retort doors. Fig. 9 shows a horizontal section taken below the floor or roadway and above the condensing pipes and tanks. Fig. 10 shows a vertical section on an enlarged scale, of parts appearing in Fig. 2. Fig. 11 shows a horizontal section on an enlarged scale, of parts appearing in Fig. 5.

The same letters of reference indicate the same parts in all the figures.

The plant here shown consists of a set of eight sector-shaped retorts *a*, placed around a central chimney *b*, and surrounded by a sunk passage-way *c*. The passage-way is covered either by tile arching or a platform of planks, which forms a circular road-way *c'* around the retorts. Over this road-way, the garbage-carts travel, dumping their loads directly into the retorts designated by the attendant, and moving away immediately. Each retort is designed to hold ten loads. The hatchways of the retorts have iron doors *d*, so hinged that, when open, they stand at an angle on each side, and are supported by brackets *d'*, as shown in Fig. 8, presenting a space wide enough to catch all the garbage from the most careless dumping; and, on closing them, everything is thrown into the retort. The doors fit closely in rabbeted iron frames, and are rabbeted where they meet, and a powerful lever fastening d^2 makes all the joints tight. While delivery is going on above, the work of attending fires, cleaning flues, shifting dampers, removing charcoal, and drawing off the liquids in the tanks, takes place in the passage-way below, which is reached by two flights of steps c^2 on opposite sides, outside the cart-way. The whole is sheltered by a light structure *e* of corrugated iron.

Below each retort is a fire-box or combustion-chamber *f*, having a grate *f'* over its bottom, and below the grate is an ash-pit f^2. Communication may be had with the retorts, combustion-chambers and ash-pits from the passage-way *c*, through doors arranged as a furnace-front.

Tanks *g* are built in the sunk passage-way, and are for receiving distilled products of the garbage. Pipes *h* connect the retorts separately with a common circular pipe *h'*, from which pipes h^2 extend to condensing-pipes h^3 on the exterior. These condensing-pipes communicate with the tanks *g*. The pipes are suitably valved, for the purpose of cutting off communication between them and the retorts or any of them. Other pipes *i* connect the retorts severally with a common circular pipe *i'*, and pipes i^2, communicating with the latter, extend to the ash-pits f^2, where they divide into perforated tubes forming burners i^3 along the opposite sides of the ash-pits, as shown in Fig. 4.

The retorts comprise four sections, and for convenience the retorts are numbered from 1 to 8 in Fig. 5, and Nos. 1 and 2, 3 and 4, 5 and 6, and 7 and 8 form the sections. A chamber *j* extends over the inner side of each section between the same and the chimney; and ports *j'* provide communication between the chambers and the fire-box, said ports being closed by valves j^2. There is one of these ports for each retort, and the chambers *j* are separated from each other. A circuitous flue *k* passes around the chambers *j* between each two retorts. Directly opposite each point of communication of the said flue with these chambers, a port *k'* extends from the chamber into the chimney-flue. A valve k^2 is fitted in each radial branch of the flue *k* and is adapted to either close communication between the flue and the chamber *j* or between the latter and the chimney. These

valves are composed of blocks of fire-clay, and are operated by means of rods k^3, extending into the passage-way c, where they are provided with handles. Each alternate valve k^2 is of sufficient length to extend completely across the chamber j when drawn back to a certain position.

Inspecting the plant at any given moment, a fire is found burning under one of the retorts only, say No. 1, the contents of which are at a temperature of about 1,000°. The gases from the heated grease are nearly driven off and are passing to the gas-tubes under the grates, where they are mixed with air and burning strongly. The heated products of combustion from the burning gas pass from the fire-box through the port j', the valve of which is lifted, and into the chamber j and flue k, through which they circulate, as shown by the arrows, around all the retorts in succession, the valves k^2 closing communication with the chimney, except at retort No. 8, where the valve is drawn back and opens communication at this point with the chimney, while it closes communication between the flue and the chamber j. Thus the products of combustion, unable to go backward or to find any nearer outlet, are compelled to make the full circuit of the retorts before escaping. The second retort, receiving the heat with little diminution, is at a temperature of perhaps 800°. The charge or garbage in it is rapidly disengaging inflammable gases, which are collected and joined with those from No. 1 to supply the fire under No. 1. In the third retort, the temperature is still lower, and so on until the last is reached, which is nearly cool. From this the charcoal residue has been removed, and it is ready to receive fresh garbage. By the time it is filled, the contents of No. 1 are thoroughly roasted, and production of gas from them has ceased. The valve of the port j' at this retort is then dropped, by means of a rod extending through the domed top; the valve of the next port j' is raised; the valve k^2 between retorts Nos. 1 and 2 is drawn back, so as to cut off communication between the port j' and the chimney; and the gas fire is shifted to No. 2. The products of combustion circulate as before, but from a starting-point one retort in advance. Retort No. 1, being now the last one reached by the heat, soon cools. Its charred contents are then raked out into barrows, leaving it ready to receive the next ten loads of garbage. This process is repeated continuously, the fire being constantly shifted around the circle.

The chimney is of common brick, with fire-brick next the flues. The fire-boxes are lined with fire-brick, and covered with a flat arch of fire-clay tiles, which forms the bottom of the retorts. The walls of the retorts are of fire-brick, and the top is formed by a double dome of flat tiles, forming an air-space. All the tile arches and domes are laid in Portland cement, except the joints exposed to fire, which are of fire-clay.

The plant is arranged so that all the valuable parts of the garbage may, if found profitable, be utilized. At a temperature of 190°, which is about that of the last retort, alcohol, of which fermenting garbage contains a large quantity, distills over, and is led through the vapor-pipes h h' h^2 h^3 to one of the condensing-tanks g, from which it may be afterward drawn for purification or sold directly to rectifiers. When the temperature reaches 240°, which will be at the shifting of the fire, the alcohol will have been entirely vaporized, and acetic acid will begin to pass over, mixed with steam. This is condensed into another tank, for sale or for treatment with lime. As soon as the steam ceases to contain alcohol or acetic acid in paying quantities, it is turned into the general condensing-tank, from which the condensed liquid, after cooling, is discharged into the sewer through a pipe m. The greasy solids remaining, being decomposed by further heating, furnish the gas for burning in the furnaces; leaving a final residue of animal and vegetable charcoal, rich in phosphates and potash, which will be valuable as a fertilizer.

The tanks g are divided into compartments of proper relative capacity, and the vapor-pipes are provided with valves whereby the distillate may be directed as desired.

Attention may be called to the following points of superiority in this form of disposal plant:

All garbage is dumped at once into the retorts, and hermetically sealed. There is no temporary storage, even though a whole day's supply may be delivered at once, and no re-handling. Sterilization takes place immediately, and the contents of the retorts are not again exposed to the air until the charred residue is raked out.

The action of the retorts is continuous. The fires never go out, night or day, but the process may be made rapid or slow, to suit varying conditions of delivery.

The vapors and gases from the retorts are never allowed at any time to escape into the open air, even through the chimney, the condensible vapors being all condensed in closed tanks, and the other gases burned in the furnaces.

The consumption of fuel is very small. The water from the garbage is evaporated by the waste heat, leaving a residue of grease and dry animal and vegetable matter, which, when further heated, produces an immense quantity of hydrocarbon gas, unmixed with steam, and probably sufficient to supply nearly if not quite all the fuel required after the first few hundred pounds of coal used to start the process.

The labor cost is reduced greatly. There is no shoveling of garbage, no treatment with benzine, no picking out of tin cans, and, after

the first few hours, little or no feeding with coal or removal of ashes; the handling consisting simply in opening and shutting the retort doors on the delivery of the loads, shifting the valves and dampers, and raking out the charcoal from the cool sections.

It is evident that the apparatus is susceptible of modification in many ways without departing from the spirit and scope of the invention.

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

1. A crematory, comprising in its construction a plurality of retorts for containing the matter under treatment, combustion-chambers below the retorts and separated from each other, a flue extending around the sides of the retorts, valved ports for communication between said flue and the combustion-chambers, a chimney, and valved ports for communication between the said chimney and the flue, all arranged substantially as and for the purpose described.

2. A crematory, comprising in its construction a plurality of retorts for containing the matter under treatment, combustion-chambers below the retorts and separated from each other, a flue extending around the sides of the retorts, valved ports for communication between said flue and the combustion-chambers, a chimney, valved ports for communication between the said chimney and the flue, and pipes forming communication between the retorts and the combustion-chambers and adapted to convey hydrocarbon gas liberated from the matter under treatment to the combustion-chambers, all arranged substantially as and for the purpose described.

3. A crematory, comprising in its construction a circular series of retorts, combustion-chambers below the same, a sunk passage-way around the combustion-chambers, and a covering over said passage-way and constituting a road-way for vehicles delivering matter to the retorts.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 10th day of July, A. D. 1893.

THEODORE M. CLARK.

Witnesses:
A. D. HARRISON,
F. PARKER DAVIS.