

(No Model.)

3 Sheets—Sheet 1.

G. H. WARNER.
FURNACE FOR BURNING GARBAGE, &c.

No. 468,852.

Patented Feb. 16, 1892.

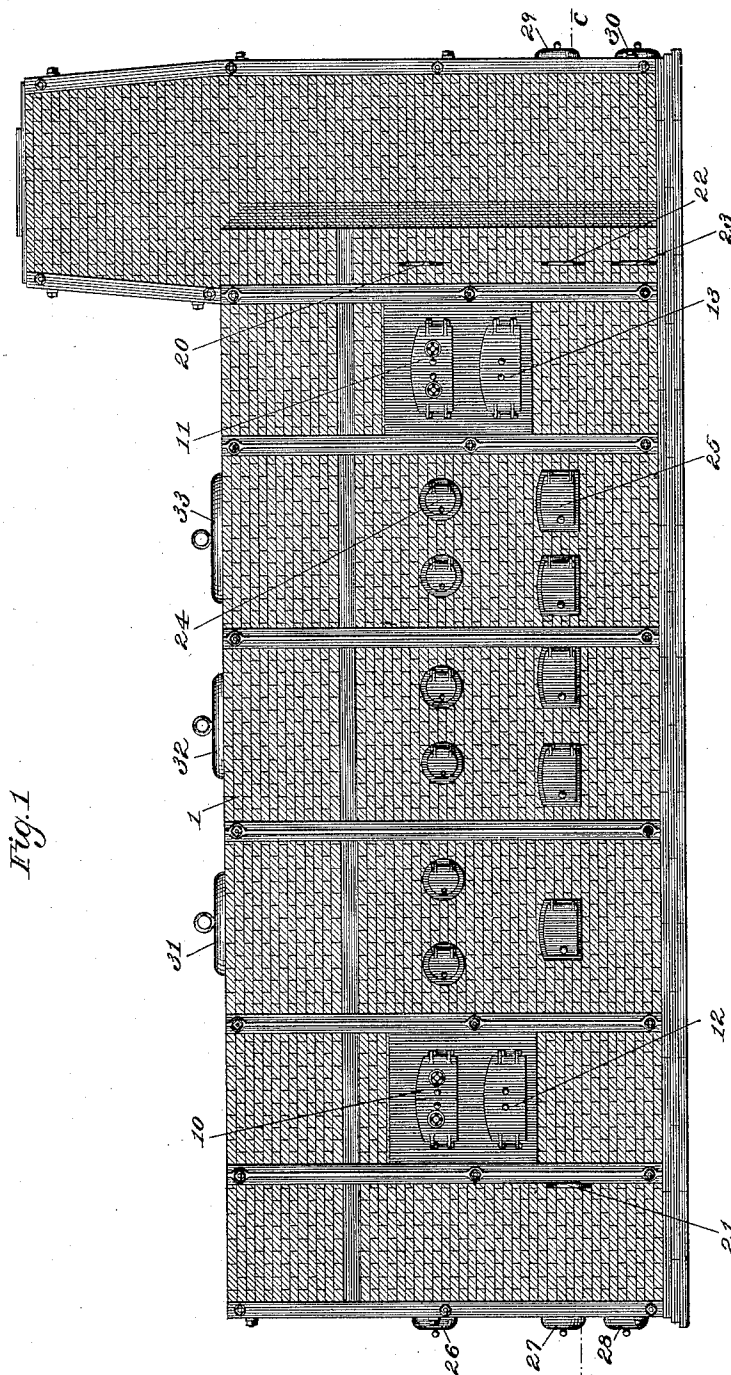


Fig. 1

Witnesses:

Henry L. Rickard.

H. Mallin.

Inventor:

George H. Warner
By his Attorney,
Albert H. Walker

(No Model.)

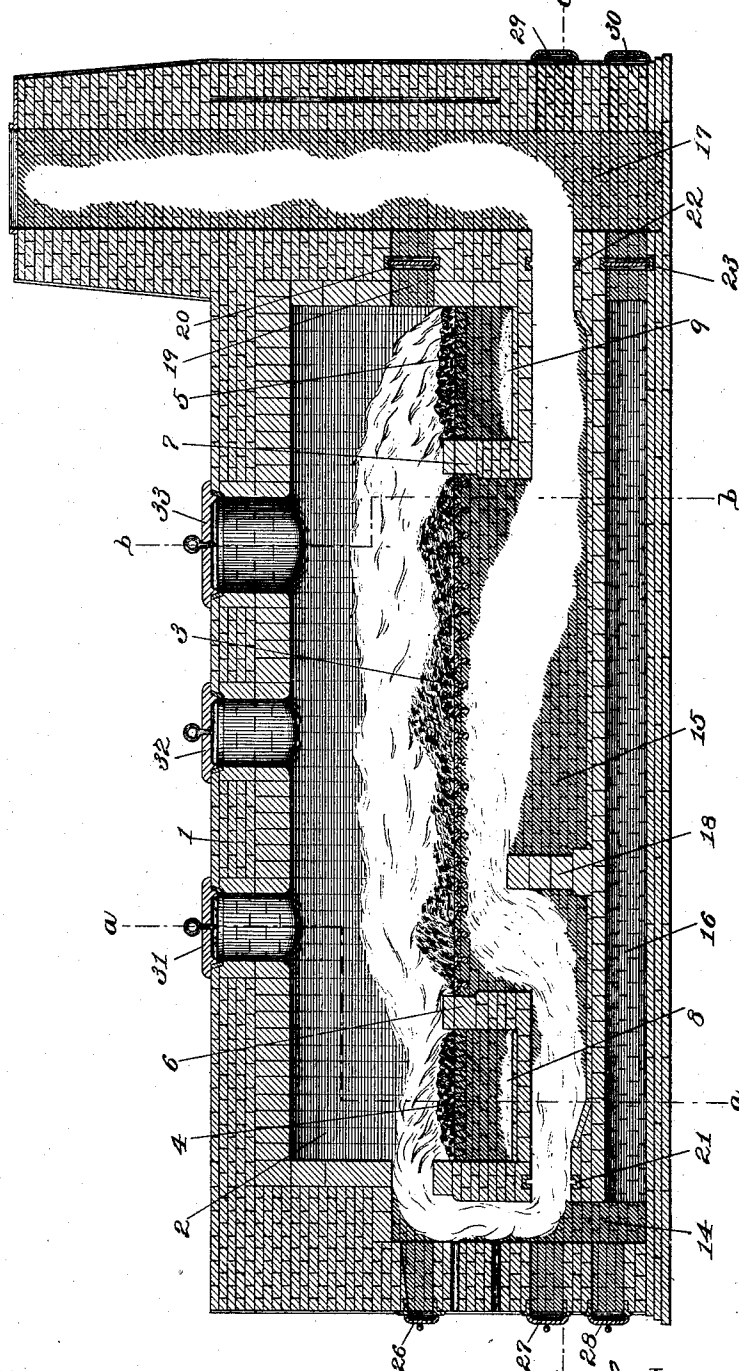
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Fig. 2



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(No Model.)

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Fig. 5

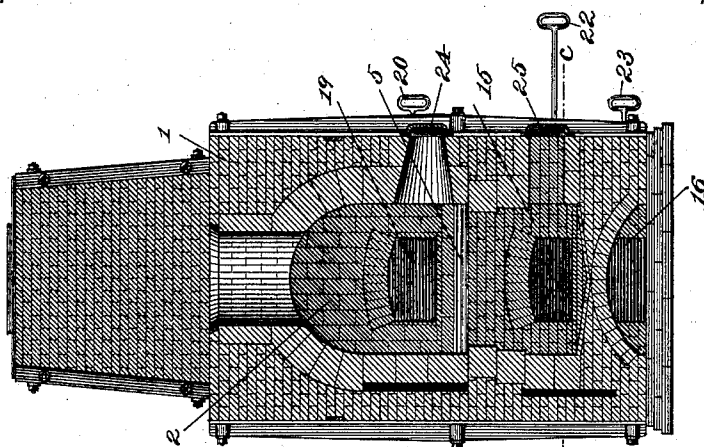


Fig. 4

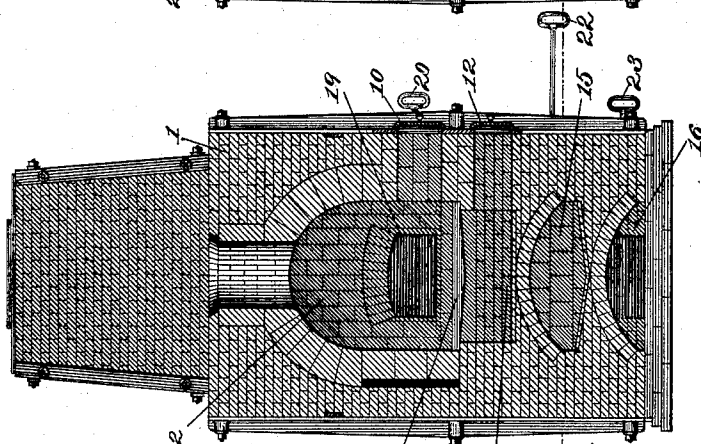
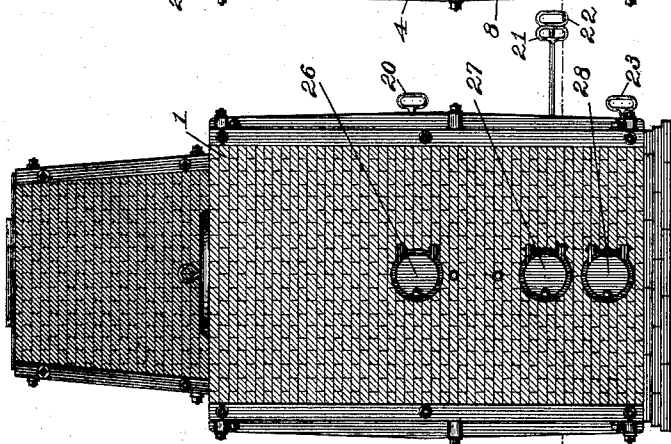


Fig. 3



Witnesses:

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H. Mallner

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UNITED STATES PATENT OFFICE.

GEORGE H. WARNER, OF HARTFORD, CONNECTICUT.

FURNACE FOR BURNING GARBAGE, &c.

SPECIFICATION forming part of Letters Patent No. 468,852, dated February 16, 1892.

Application filed May 21, 1891. Serial No. 393,658. (No model.)

To all whom it may concern:

Be it known that I, GEORGE H. WARNER, of Hartford, Connecticut, have invented a new and useful Furnace for Burning Garbage and other Wet and Offensive Substances, of which the following description and claims constitute the specification, and which is illustrated by the accompanying three sheets of drawings.

This furnace is suitable for use in so volatilizing and burning garbage, night-soil, and other wet and offensive substances as to cause those substances themselves to furnish fuel for their own evaporation and combustion, and as to make that combustion so complete that no offensive odors or injurious gases can escape from the furnace.

Figure 1 of the drawings is a longitudinal elevation of the furnace. Fig. 2 is a central perpendicular longitudinal section, and Fig. 3 is a view of the left-hand end of the furnace. Fig. 4 is a vertical section on the vertical parts of the dot-and-dash line *a a* of Fig. 2. Fig. 5 is a vertical section on the dot-and-dash line *b b* of Fig. 2.

The brick-work, which composes the body of the furnace, is indicated by the numeral 1, and is exteriorly stayed and strengthened with iron bars and bolts, as shown in the drawings. The oven 2 is constructed of fire-brick and constitutes the upper part of the interior of the furnace. Its floor may also be made of fire-brick, with or without openings therethrough; but the drawings represent that part of the oven as consisting of pieces of railroad-rails extending crosswise of the furnace and parallel to each other and bottom side up and separated far enough from each other to constitute the grate, which is indicated by the numeral 3. The fire-place 4 is located at the front end of the oven and the fire-place 5 is located at the rear end of the oven, and the grates of these two fire-places are on a level with the grate 3 and are separated therefrom by the bridge-walls 6 and 7, respectively. The ash-pits 8 and 9 are located under the fire-places 4 and 5, respectively. The double doors 10 and 11 give access to the fire-places 4 and 5, and the similar doors 12 and 13 give access to the ash-pits 8 and 9, respectively. The downward flue 14 is connected at its upper end with the fire-place 4 and is connected

below the ash-pit 8 with the horizontal flue 15, and is connected at its lower end with the horizontal flue 16. The horizontal flue 15 extends lengthwise of the furnace under the ash-pits 8 and 9 from the downward flue 14 to the chimney 17, and is provided with the transverse vertical deflecting-wall 18 between those ash-pits. The horizontal flue 16 extends from the downward flue 14 to the chimney 17 under the horizontal flue 15. The short horizontal flue 19 extends from the fire-place 5 into the chimney 17 and is provided with the slide-valve 20. The slide-valves 21 and 22 are placed in the ends of the horizontal flue 15 adjacent to the downward flue 14 and the chimney 17, respectively, while the valve 23 is placed in the end of the horizontal flue 16 adjacent to the chimney 17. The door 24 and the other five round doors of the same horizontal series open into the front side of the oven 2, while the door 25 and the four other doors of the same horizontal series open into the front side of the horizontal flue 15. The doors 26, 27, and 28 open into the downward flue 14 opposite to the three connections of that flue with the interior of that furnace, as shown in Fig. 2, while the doors 29 and 30 open into the chimney 17 opposite to the ends of the horizontal flues 15 and 16, respectively. The covers 31, 32, and 33 inclose vertical openings through the top of the furnace into the oven 2. The horizontal dash-and-dot line *c c* indicates the plane of the surface of the ground upon which the furnace is erected.

The mode of operation is as follows: The covers 31, 32, and 33 are lifted, and garbage, night-soil, dead animals, and other wet and offensive substances and bodies are dumped through the vertical openings under those covers upon the grate 3, so as to deeply cover that grate with a pile of matter to be destroyed. The valves 20 and 23 are closed and the valves 21 and 22 are opened, and fires are made on the fire-places 4 and 5. Thereupon the flames from the fire-place 5 pass over the wet and offensive substances in the oven 2 and dry and ignite those substances. The steam and the gases and other products which result therefrom are carried with the flames from the fire-place 5 into and through the flames on the fire-place 4, and in the mingled flames from the two fire-places all the com-

bustible gases and matter which were not entirely consumed in the oven are burned up. The mingled flames from the two fire-places pass from above the fire-place 4 into the downward flue 14, and thence into the flue 15, and then through that flue under the ash-pit 8 over the deflecting-wall 18 and under the ash-pit 9 into the chimney 17. In the course of this passage much of the heat from the stream of flames passes upward through the grate 3 into the mass of matter above the grate, so as to heat that matter from below and thus co-operate with the flames above it in volatilizing its liquid constituents and in consuming its solid contents. Thus the operation continues until some portion of the grate 3 is uncovered by the burning up and consequent removal of the substances upon that portion. When this occurs, if no change is made in the positions of the valves the fire from the fire-place 5 will pass downward through the openings in the uncovered portion of the grate 3 into the flue 15, and thence into the chimney 17 without carrying the products of the combustion in the oven 2 through the fire on the fire-place 4. This is a result to be avoided, because when the furnace operates in that way some of the gases and some of the smoke which would otherwise be all consumed in the furnace will pass upward through the chimney 17 into the external air, and this result can be avoided by closing the valves 21 and 22 and opening the valve 20, or by shutting the valves 21 and 22 and opening the valve 23. In the first of these cases the flames from the fire-place 4 will immediately pass over the unconsumed substances remaining on the grate 3 and into the flames on the fire-place 5. Those flames now become the secondary or smoke and gas consuming fire, which burns up the products of the combustion carried on in the oven 2 by the flames from the fire-place 4, because the draft is now into the chimney through the flue 19 instead of, as before, through the flue 15. In the second of the above-described ways of shifting the positions of the valves, after a portion of the grate 3 is uncovered, the mingled flames from the fire-places 4 and 5 pass into the downward flue 14, as before; but instead of passing through the horizontal flue 15 they pass through the lower horizontal flue 16 into the chimney 17, and thus take the third of the three courses through which the stream of flame may pass from the fire-places to the chimney. The first of those courses is the one particularly shown in Fig. 2, and it is preferable to either of the others whenever there is no opening for the passage of flames through the grate 3, because it accomplishes all the results accomplished by either of the other courses, and in addition thereto throws a larger amount of heat upward through the grate 3 into the mass of matter above it; but whenever any portion of the grate becomes uncovered it is necessary to shift the direction of the flames either into the second course or the third

course in order to secure the perfect combustion of the smoke and gas produced in the oven. The third course is better than the second, because in passing through the horizontal flue 16 the stream of flame throws some of its heat upward through the floor of the flue 15, where it aids to evaporate whatever water that floor may have received by dripping through the grate from the garbage or other matter above it, and if there is no water to be thus evaporated the heat passing upward through the floor of the flue 15 will pass still farther upward and through the grate 3. While the stream of flame is passing through the flue 15 it evaporates whatever water is received from above by the concave floor of that flue. The result of the mode of operation set forth in this paragraph is to thoroughly burn up all the garbage, night-soil, dead animals, and other wet and offensive substances and bodies upon the grate 3 without emitting from the furnace any offensive odors or injurious gases, and leaving on the grate 3 or on the floor below it nothing but non-combustible ashes.

The strength of the draft of the furnace depends, of course, upon the height of the flue through the chimney 17, and that chimney may be carried as far upward as is desired for that purpose, or it may terminate at such an elevation as is shown in the drawings, or it may be surmounted by a smoke-stack of greater or less elevation, according to the circumstances of particular cases.

The flue 16 may be omitted from this furnace without extensively diminishing its utility, and in that case the stream of flame will be guided into the first or into the second of the above-described courses, according to the particular conditions of the burning at different times; or the flue 19 may be omitted from the furnace, while the flue 16 is retained, and in that case the stream of flames will be guided into the first or into the third of the above-described courses at different times, but never into the second. So, also, the flues 16 and 19 may both be omitted, and the flames will be compelled to take only the first of the above-described courses, which is that shown in Fig. 2; but in this case the furnace will not always consume all of the smoke and gases which it produces unless a closed floor is substituted for the grate 3, so as to positively prevent any draft through the bottom of the oven 2. Such a closed floor may be substituted with good results, especially when the matter to be burned is comparatively dry, and it may also be substituted even when that matter is loaded with considerable water if the bridge-walls 6 and 7 are made high enough and tight enough to prevent that water from running into the fire-places 4 and 5. The bridge-walls 6 and 7 may sometimes be reduced nearly or quite to the level of the grate 3, in order to facilitate the occasional stoking of dried and partly-burned garbage upon that grate over upon the adjacent bor-

ders of the fire in the fire-places 4 and 5, as the case may be; but such putting of garbage upon the fire-places should be done only with good judgment taught by experience, because otherwise it may diminish the efficiency of the furnace.

The downward flue 14, which draws the flames from the fire-place 5 entirely across the fire-place 4 and through the flames thereon and carries those mingled flames around and under the fire-place 4, is the principal distinguishing characteristic of this invention, and a somewhat extensive experience in building various forms of garbage-furnaces, including several like that shown in the drawings, proves that characteristic to be one of marked materiality in value. This merit resides in the fact that the gases and other products of the combustion caused in the oven 2 by the flames from the fire-place 5 are all carried positively and inevitably through the flames on the fire-place 4 and in the fact that those mingled flames from the two fire-places are carried under the entire length of the grate 3, so as to contribute the largest practicable amount of their heat to the drying of the substances and bodies upon that grate. The bridge-wall 18 also contributes to this latter result by deflecting upward the flames in the flue 15.

Several garbage-furnaces nearly or quite identical with that shown in the accompanying drawings and explained in this description have been built under my direction within the last year, and each of them has demonstrated its capacity to thoroughly burn up as many as one hundred and fifty cubic yards of garbage and night-soil in a day.

I claim as my invention—

1. The combination of the oven 2 with the fire-places 4 and 5 at opposite ends thereof, and with the grate 3 or other floor of the oven between them, and with the downward flue 14 and the horizontal flue 15, giving an outlet to the flames from the fire-places and the oven around and under the fire-place 4, thence under the floor of the oven, and thence under the fire-place 5 into the chimney 17, all substantially as described.

2. The combination of the oven 2 with the fire-places 4 and 5 at opposite ends thereof, and with the grate 3 or other floor of the oven between them, and with the downward flue 14 and the horizontal flue 15, giving an outlet to the flames from the fire-places and the oven around and under the fire-place 4, and thence under the floor of the oven, and thence under the fire-place 5 into the chimney 17, and with the flue 19, adapted to give another outlet to the flames from the fire-places and the oven, and with one or more valves in each of those outlets and adapted to open and close them, respectively, substantially as described.

3. The combination of the oven 2 with the fire-places 4 and 5 at opposite ends thereof, and with the grate 3 or other floor of the oven between them, and with the downward flue 14, giving an outlet to the flames from the fire-places and the oven around the fire-place 4, and with the flues 15 and 16, provided with valves and adapted to alternately give an outlet from the downward flue 14 into the chimney 17, all substantially as described.

GEORGE H. WARNER.

Witnesses:

ALBERT H. WALKER,
ESTHER S. WALKER.