Sept. 11, 1945. H. W. SHARPE 2,384,496

GARBAGE INCINERATOR

Filed Dec. 29, 1941 2 Sheets-Sheet 1

Fig 1.

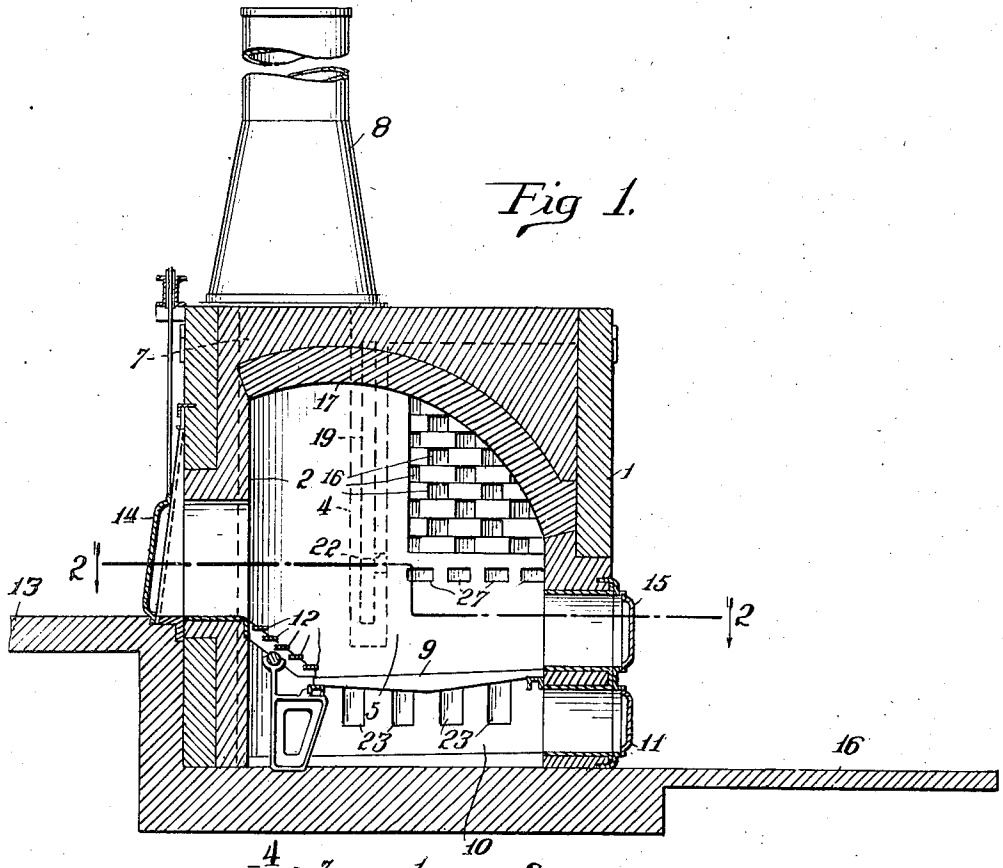
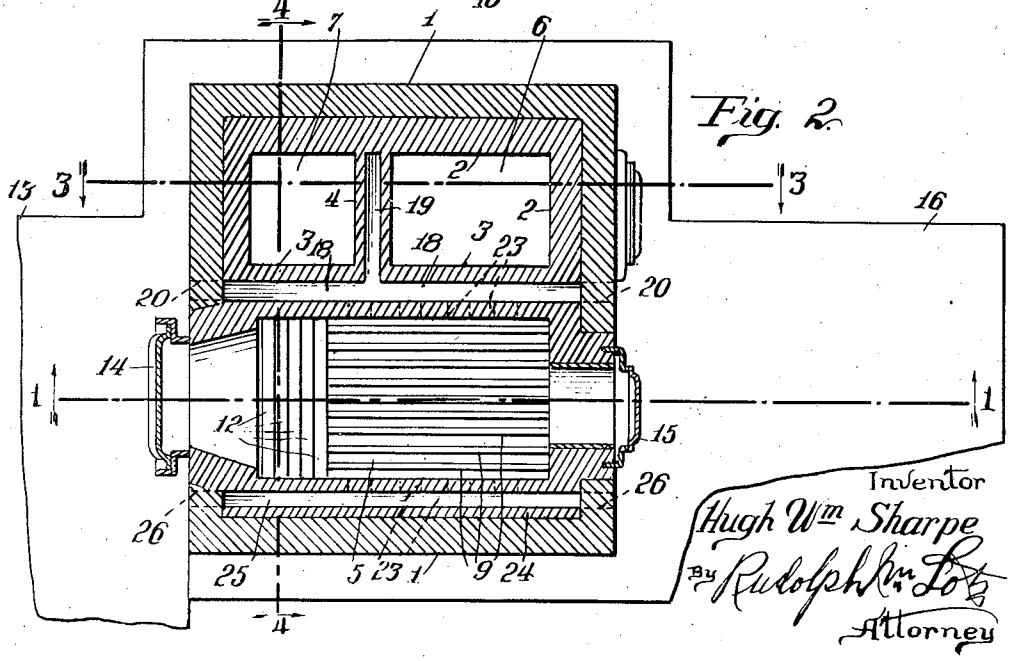


Fig. 2.



Inventor
Hugh Wm Sharpe
By Rudolph Wm Lotz
Attorney

Sept. 11, 1945. H. W. SHARPE 2,384,496

GARBAGE INCINERATOR

Filed Dec. 29, 1941 2 Sheets-Sheet 2

Fig. 3.

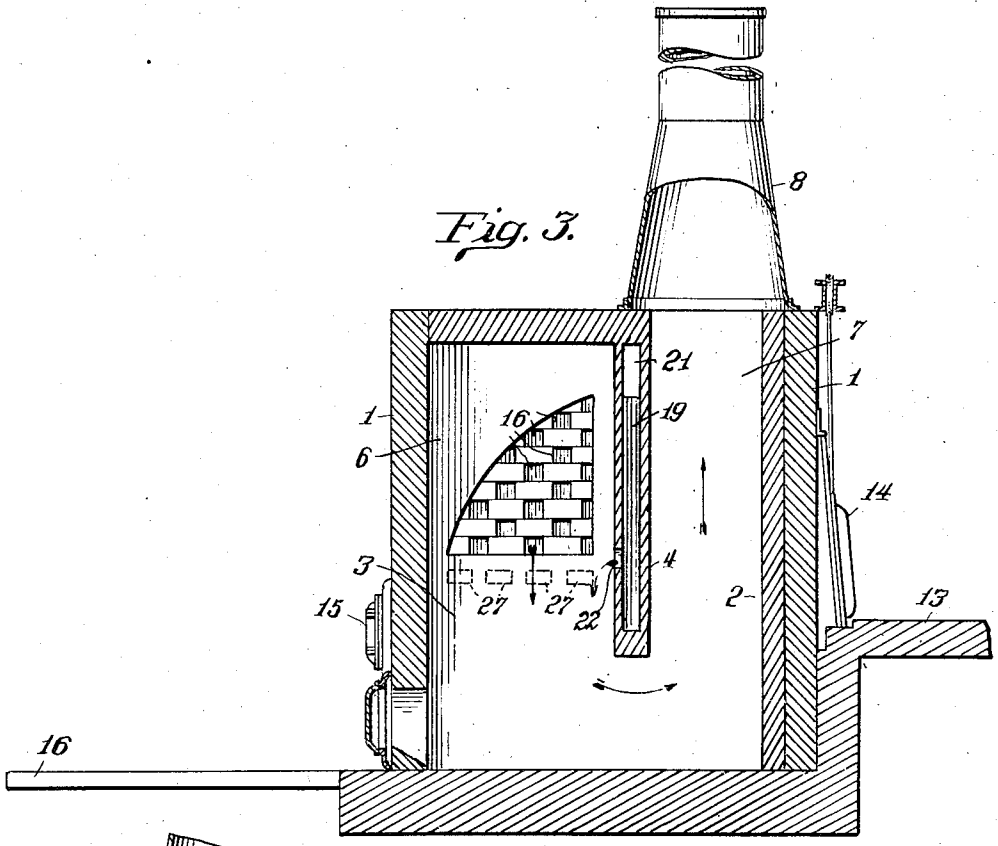
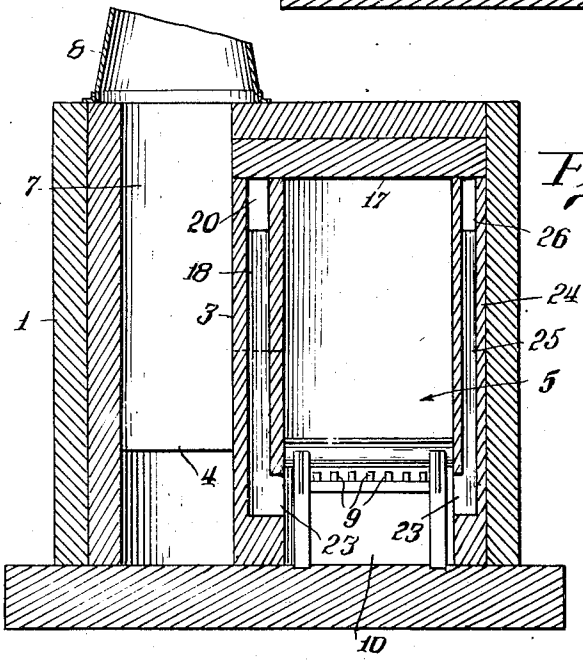


Fig. 4.



Inventor
Hugh Wm Sharpe
By Rudolph Mc Lot
Attorney

Patented Sept. 11, 1945 2,384,496

UNITED STATES PATENT OFFICE

2,384,496

GARBAGE INCINERATOR

Hugh W. Sharpe, Chicago, Ill.

Application December 29, 1941, Serial No. 424,687

9 Claims. (Cl. 110—8)

This invention has for its main object to provide a garbage incinerator capable of being built in sizes ranging from portable for army use, to such as would be required for city plants of necessarily very large capacity, and which is very efficient, simple in construction and smokeless in operation.

In the accompanying drawings illustrating the invention as embodied in a stationary unit built upon a suitable foundation:

Fig. 1 is a vertical longitudinal sectional view of a garbage incinerator constructed in accordance with the invention, taken on the line 1—1 of Fig. 2.

Fig. 2 is a plan sectional view of the same taken on the line 2—2 of Fig. 1.

Fig. 3 is a vertical longitudinal sectional view of the same taken on the line 3—3 of Fig. 1.

Fig. 4 is a vertical transverse sectional view of the same taken on the line 4—4 of Fig. 2.

The structure comprises outer walls 1 of a suitable material, inner walls 2, and partition walls 3 and 4 of material such as fire-brick.

The partition walls 3 and 4 divide the structure into a combustion chamber 5, a downdraft flue 6 and a chimney flue 7, the latter continuing through the chimney 8.

The combustion chamber 5 is equipped with the grate 9 disposed to provide an ash-pit 10 below said grate to which access is had through the door or gate 11 which may, of course, be equipped with damper controlled openings (not shown) of conventional type.

At the front of the grate 9 there is provided a suitable series of stepped and spaced apart plates 12 upon which freshly introduced wet garbage is adapted to be deposited for dehydration preparatory to ignition thereof following such dehydration and the advancing of the same over the grate 9. Said plates 12 establish communication between the ash-pit and the combustion chamber through the open spaces therebetween and are disposed so that the surface of a mass of garbage disposed over them is substantially concentric with the arched top wall 17 of said combustion chamber for reasons and purposes set forth hereinafter.

At the front of the structure there is provided a suitable platform 13 from which garbage is introduced into the combustion chamber, through the feed door or gate 14 of conventional type which is disposed for substantially vertical movement to and from closed position in a conventional manner. The opening controlled by the gate 14 has its bottom wall spaced from the uppermost plate 12 a distance substantially equal to the spacing apart of said plates 12, the platform 13 being substantially level with said bottom wall of said feed opening.

At the rear of the grate there is an opening controlled by a conventional type of door or gate 15, through which suitable tools may be inserted for spreading material over the grate surface, including the garbage disposed upon the plates 12.

Ashes and the like are removed from the ash-pit and incombustibles such as tin cans, glass and the like removed from the grate, are adapted to be deposited upon the platform 16 at the rear of the structure.

In the partition wall 3 there is provided a foraminous or checkerwork flue or flame port 16 the checkerwork of which is composed of fire-brick, which establishes communication between the combustion chamber 5 and the downdraft flue 6 which constitutes a secondary or gas and smoke consuming combustion chamber. Said flue 16 is disposed at the rear end portion of the combustion chamber immediately adjacent the arched top wall 17 of the combustion chamber and in spaced relation to the grate.

The downdraft flue 6 is of far greater area in plan section than the chimney flue 7 and the total aggregate area of the flue or port 16. Immediately below said port 16 a series of openings 23 are provided for connecting the combustion or burning chamber with the flue in the hollow wall 3 for admission of preheated air to admix with the gases passing through the port 16.

The partition wall 4 is commonly termed a "curtain wall" the lower edge of which is spaced from the bottom wall of the housing such distance as to provide a connecting flue or opening between the chimney and downdraft flues which is of greater area than the chimney flue and less area than the downdraft flue.

The walls 3 and 4 are hollow throughout the height thereof from points adjacent to but spaced from their lower edges. The hollows or flues 18 and 19 formed in said walls 3 and 4 respectively communicate with each other and each thereof communicates with atmosphere through suitable air-intake and discharge openings 20 and 21, respectively, located at or near the upper ends of said flues, and which extend through the outer walls of the structure.

The lower end portion of the flue or hollow 19 of the curtain wall is connected with the down-

draft flue by means of a series of openings 22 spaced from the lower end of said wall.

Openings 23 are provided to connect the hollow or flue 18 of the partition wall 3 with the ash-pit at a point appreciably below the grate. The fire-brick lining wall 24 of the ash-pit and combustion chamber is also preferably hollow to provide a flue 25 connected with the ash-pit below the grate and connected at its upper end portion with atmosphere by means of openings 26. Openings 27 below the checkerwork opening 16 connect the combustion chamber with the flue within the partition wall 3 and serve to admix fresh hot air with gases passing through the said checkerwork.

The flues 6 and 7 have a common bottom wall upon which fine ash is adapted to settle, the latter being removable through a gate controlled opening 20 in the rear wall of the structure, said opening being shown in dotted lines in Fig. 2.

It is very obviously desirable that the structure shall be smokeless and that no sparks shall be projected from the chimney thereof so that fire-hazard and nuisance may be avoided in both domestic and field uses by military forces, smokelessness and spark projection being particularly important in instances of portable structures which have been successfully tested and approved.

It has been common practice in the art to equip the chimney with screens to prevent sparking but such screens serve to choke the chimney very appreciably and sometimes to the extent that the structure is rendered inefficient, the military use requirement being that the structure shall be smokeless and sparkless as well as efficient.

The instant structure meets the said requirements and in operation the grate is first loaded with suitable fuel for preheating purposes before garbage is introduced into the same. This preheating is continued until the arch and walls of the combustion chamber and flues have attained a high temperature, as, for example, until the arch is heated to red.

As soon as this preheating has attained the desired degree, garbage is introduced and deposited over the plates 12 and in part over the burning fuel. The incandescence of the arch 17 causes light rays to be concentrated upon the garbage to heat the same by radiation as well as by convection, due to contact with hot gases and flame in the combustion chamber and hot air passing through the mass from the ash-pit, said air being heated to a high degree while flowing through the several flues formed in the hollow walls.

The garbage is thus dehydrated very rapidly and is then spread manually over the fuel on the grate. This spreading is followed immediately by introducing another mass of fresh garbage, the garbage on the grate soon constituting the fuel load which is replenished by the spreading thereover of succeeding dehydrated masses of same.

In the operation as above described, the flame and gases generated by combustion swirl about a horizontal axis between the arch 17 and the mass of fresh and burning garbage through an arc ranging from three-quarters to one and one-half revolutions, depending upon manipulations of the doors at the respective ends of the combustion chamber or if desired damper controlled openings may be provided in said doors, and due also to the fact that the gases must remain confined in the combustion chamber for a period determined by the area of the checkerwork flue in the wall 3 and the suction created in the chimney flue.

Thus the flaming gases in the combustion chamber are caused to flow at greatest speed of travel through the checkerwork flue and at lowest speed through the downdraft flue wherein said gases become admixed with the hot air flowing from the said openings 22 in the curtain wall to supply thereto added oxygen to assure combustion of smoke admixed with said gases.

The speed of travel of the latter through the opening leading to the chimney flue is greater than speed of travel through the downdraft flue and said rate of flow is increased appreciably in the chimney flue and through the chimney, the gases being discharged free of smoke and sparks, due to the settling of the latter during the period of slow flow through the downdraft flue.

The plan sectional area of the portion of smallest diametric dimensions of the chimney or chimney flue is appreciably greater than the aggregate area of the opening through the checkerwork flue plus the aggregate area of the openings connecting the downdraft flue with the flue in the curtain wall 4, it being obvious that the suction created in the chimney flue determines the rates of travel of the gases through the checkerwork and downdraft flues.

The swirling gases in the combustion chamber travel substantially spirally toward the checkerwork flue and become admixed with hot air at that point and again within the downdraft flue or secondary combustion chamber wherein all remaining smoke is consumed.

It is common practice in the art to which the invention relates to control the admission of air to flues and discharge of products of combustion from flues, by means of manually operable dampers and such dampers may, of course, be supplied to control the openings connecting the flues in the walls 3 and 4 and the flue in the lining wall with atmosphere though this has not been found necessary or desirable. So, also, chimney draft may be initiated by disposing burning paper at the bottom of the chimney flue or by providing a damper controlled flue extending through the curtain wall 4 adjacent the upper end thereof to connect the upper end portion of the downdraft flue with the chimney flue, the damper being opened upon starting a fire in the combustion chamber and being closed as soon as chimney draft has been generated to the degree necessary to cause the gases in the downdraft flue to flow downwardly and underneath the curtain wall to the chimney flue.

The openings connecting the hollow-wall flues with atmosphere are referred to above as constituting intake and discharge openings. They function as discharge openings as soon as combustion of fuel on the grate has ceased, at which time the heat of the hollow walls will cause air from the ash-pit to flow through said flues to atmosphere and effect cooling of said walls, this being desirable in the aforesaid portable units.

I claim as my invention:

1. A structure of the type specified comprising a combustion chamber equipped with a grate and with an arched top wall having its axis extending transversely of the side walls of said chamber and having one end thereof terminating at a point spaced a shorter distance from said grate than its other end, gate controlled openings at opposite ends of said chamber, a downdraft flue disposed beyond a side wall of said chamber and

communicating therewith through an opening in said side wall disposed closely proximate to the lower end of said arched wall, a chimney flue, and a hollow curtain wall between said flues and providing a flue therebetween connected at its upper end portion with atmosphere and at its lower end portion with said downdraft flue.

2. A structure of the type specified comprising a combustion chamber equipped with a grate and with an arched top wall having its axis extending transversely of the side walls of said chamber and having one end thereof terminating at a point spaced a shorter distance from said grate than its other end, gate controlled openings at opposite ends of said chamber, a downdraft flue disposed beyond a side wall of said chamber and communicating therewith through an opening in said side wall disposed closely proximate to the lower end of said arched wall, a chimney flue, and a hollow curtain wall between said flues and providing a flue therebetween connected at its upper end portion with atmosphere and at its lower end portion with said downdraft flue, the said chimney flue being of greater area in plan section than said opening and of smaller area than the said downdraft flue.

3. A structure of the type specified comprising a casing equipped with a partition wall dividing the same into a combustion chamber and ashpit extending from end to end thereof and occupying substantially one half the space within the casing, a flue chamber occupying the remaining space within said casing, a curtain wall extending transversely of said partition wall and dividing said last named space into a chimney flue and a downdraft flue communicating with each other through an open space below the curtain wall, there being an opening through said partition wall at one end of the combustion chamber of less area than the plan-sectional area of the chimney flue and connecting the combustion chamber with the downdraft flue above the level of the lower end of said curtain wall, the plan sectional area of said downdraft flue being appreciably greater than that of said chimney flue.

4. A structure of the type specified comprising a housing divided into two compartments by means of a partition wall extending parallel with the side walls thereof, one of said compartments constituting a combustion chamber equipped with an arched roof of appreciably greater height at one end than at the other end of said chamber and having its axis extending transversely of said side walls, a grate in said chamber, a feed door in one end wall of the latter, an opening in said partition wall above the grate in the end portion thereof opposite to said feed door, a downdraft flue in the other compartment connected with said combustion chamber through said opening, a chimney flue occupying the remainder of said other compartment, a curtain wall between said flues extending from the top of said last-named compartment to a point spaced from the floor thereof and extending transversely of said partition wall and providing an opening connecting said flues at their lower ends.

5. A structure as defined in claim 4, wherein the said curtain wall is hollow and the hollow thereof is connected with atmosphere at its upper end portion and communicates at its lower end portion with one of said flues.

6. A structure as defined in claim 4, wherein the partition wall comprises an air heating flue connected at its upper end portion with atmosphere and at its lower end portion with the combustion chamber below the grate thereof.

7. A structure as defined in claim 4, wherein the partition wall and a side wall of the structure contain air heating flues connected at their upper end portions with atmosphere.

8. A structure as defined in claim 4, wherein the opening connecting the combustion chamber with the downdraft flue is disposed at a level between the ends of the said curtain wall.

9. A structure as defined in claim 4, wherein both the partition wall and curtain wall constitute downdraft air heating flues connected at their upper ends with atmosphere and at their lower end portions respectively with the combustion chamber below the grate of same and with said downdraft flue.

HUGH WM. SHARPE.