



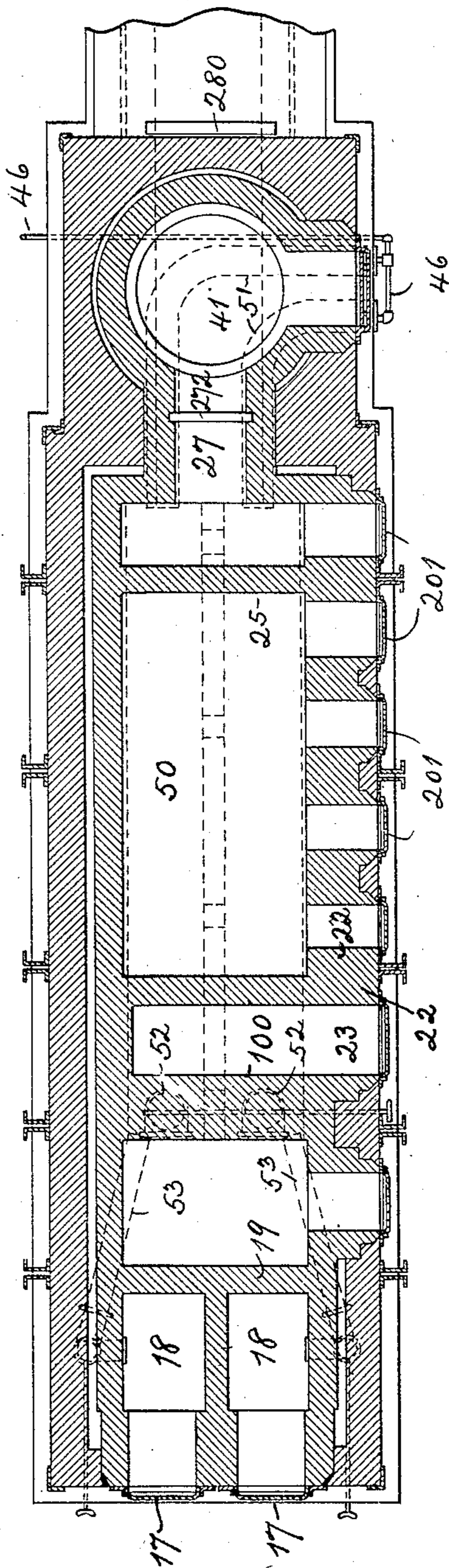
No. 835,699.

PATENTED NOV. 13, 1906.

B. BOULGER.  
GARBAGE FURNACE.  
APPLICATION FILED MAY 12, 1905.

3 SHEETS—SHEET 2.

*Fig. 2.*



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3 SHEETS—SHEET 3.

Fig. 5.

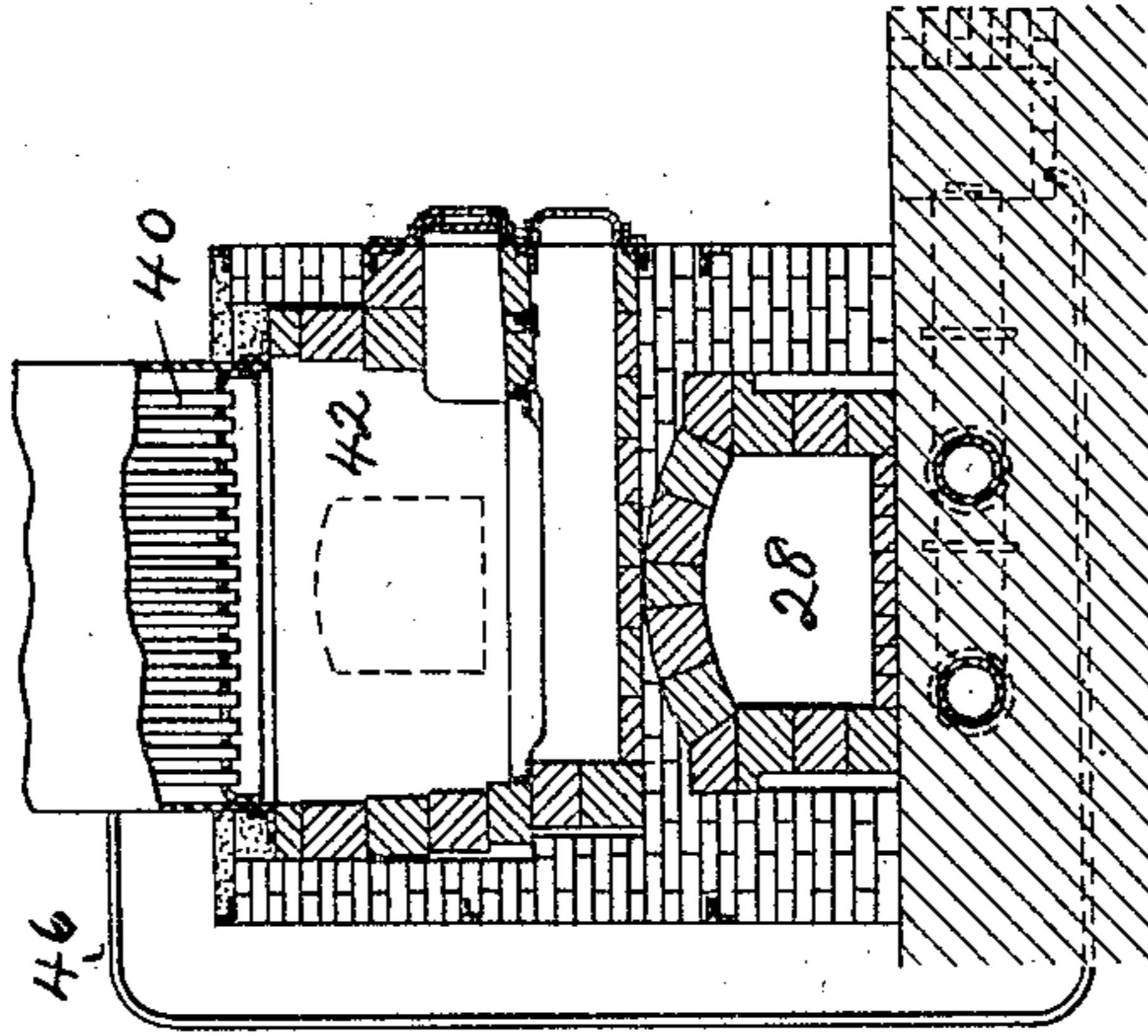


Fig. 4.

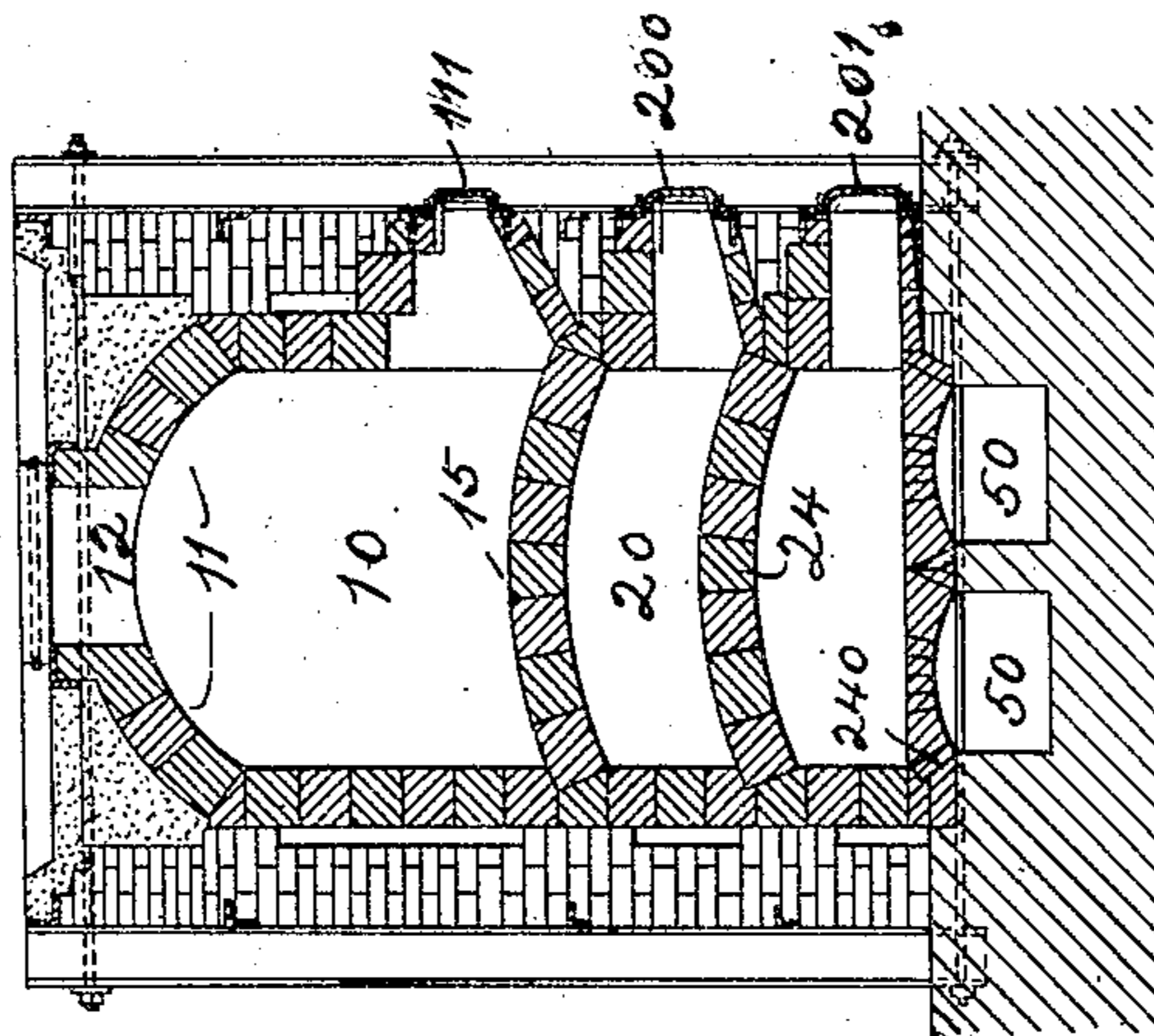
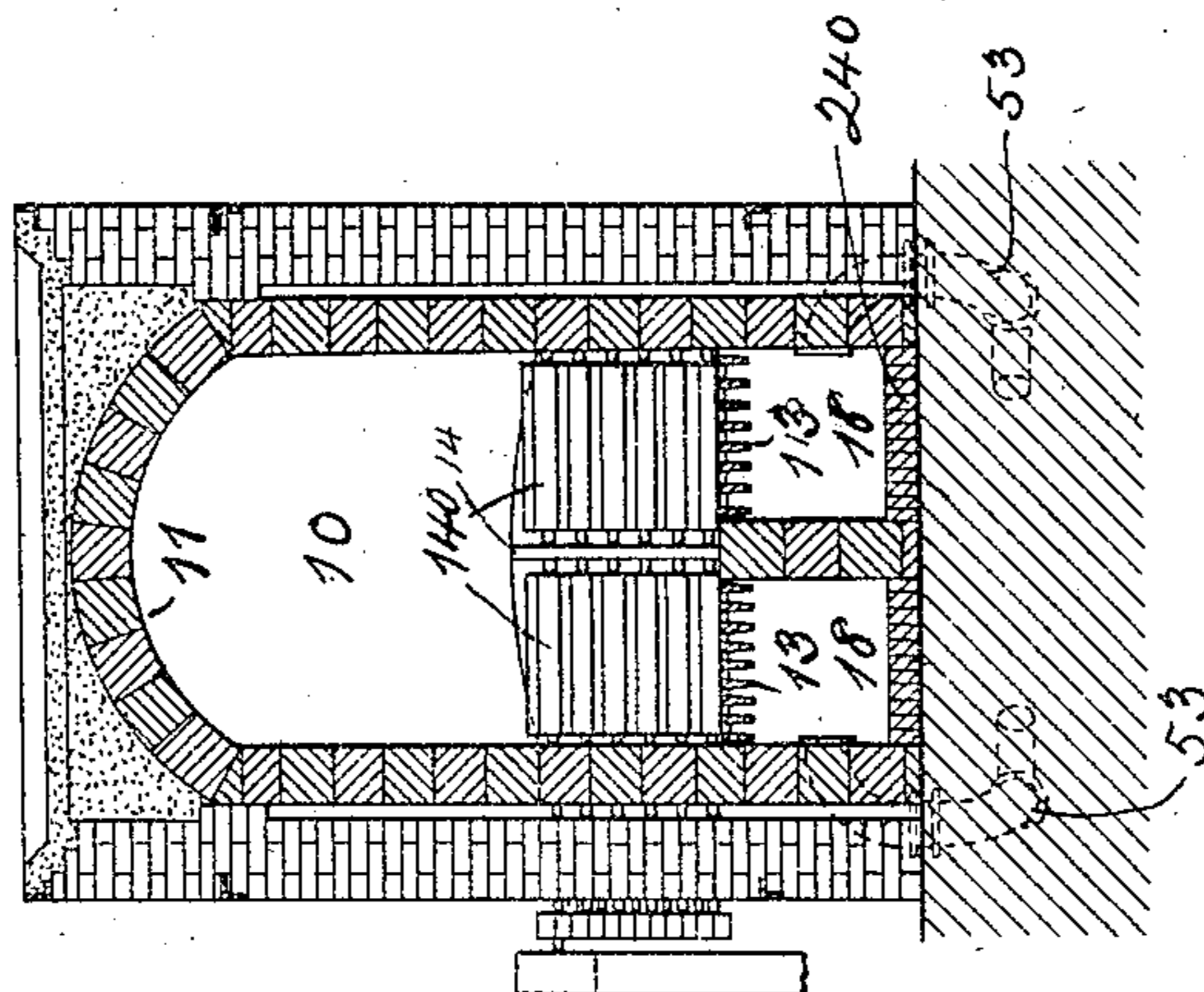


Fig. 3.



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# UNITED STATES PATENT OFFICE.

BENJAMIN BOULGER, OF NEW YORK, N. Y.

## GARBAGE-FURNACE.

No. 835,699.

Specification of Letters Patent.

Patented Nov. 13, 1906.

Application filed May 12, 1905. Serial No. 260,097.

*To all whom it may concern:*

Be it known that I, BENJAMIN BOULGER, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Garbage-Furnaces, of which the following is a specification.

My invention relates to a furnace for the incineration of garbage; and its novelty consists in the construction and adaptation of the parts, as will be more fully hereinafter pointed out.

Garbage is wet and contains many vegetable matters comprising cells retaining water in globular form, and it is difficult to get rid of this entrained water.

It is the purpose of my invention to make an efficient furnace and one in which the energy developed by the combustion of the fuel is more completely utilized.

In the drawings, Figure 1 is a vertical longitudinal section through my improved furnace. Fig. 2 is a horizontal section of the same on the plane of the broken line 2 2 in Fig. 1. Figs. 3, 4, and 5 are vertical transverse sections on the planes of the lines 3 3, 4 4, and 5 5 in Fig. 1.

In the drawings, 10 is a principal-furnace chamber having suitable walls 11 11, provided with openings 12 12, adapted to receive the material to be cremated, a grate 13, a second upwardly-inclined grate 14, and a perforated platform 15.

16 is a fuel-feeding door, and 17 a door leading to an ash-pit 18 under the grate 13. A short wall 19 serves as a support for the adjacent ends of the grates 13 and 14, and a second wall 100 serves to separate the principal-furnace chamber from a secondary-furnace-chamber.

101 is a vertical wall depending from the upper wall of the furnace and terminating beneath the level of the platform 15.

20 is the secondary-furnace chamber. In this 21 is a grate, 22 is a vertical wall supporting one side of the same, and 23 is its ash-pit.

24 is a horizontal perforated platform terminating in the wall 101, forming the rear boundary of the principal-furnace chamber 10.

111, 200, and 201 are doors leading into the interior of the apparatus from the outside.

30 is a chamber designed to promote the more complete combustion of the gases evolved in the chambers 10 and 20. It has a closed top 31, is bounded on one side by the wall 101 and on the other side by a wall 33, and is closed beneath by the floor 240 common to the entire structure. It is provided with a centrally-arranged diaphragm 25, having horizontal openings 26, and a passage 27 through the wall 23 leads outwardly therefrom for a purpose presently to be described. It is also provided with a horizontal flue 28, which leads to a suitable chimney. (Not shown.)

Adjacent to the apparatus so far described is a steam-generating plant. This comprises a boiler 40 of any suitable construction. A furnace 41 is arranged beneath the boiler and comprises the usual combustion-chamber 42; grate 43, ash-pit 44, and the other adjuncts common to such structures and which need no particular description. The flue 28, it will be observed, passes under this furnace plant. This flue is provided with a damper 280, having a handle 281 and adapted to slide vertically in suitable ways 282. The passage 27, which leads into the combustion-chamber 42, is controlled by a damper 270, having a handle 271 and adapted to slide in suitable ways 272.

A flue 45 leads from above the boiler 40 to the chimney. (Not shown.)

A steam-pipe 46, provided with suitable valves, leads from the boiler 40 down into the mouths of the pipes 51 51 and is so arranged (in a manner well understood by those skilled in the art) that a jet of steam under pressure derived from the boiler can be injected into these pipes.

The grate 14 is of the rotating kind and comprises rotatable bars 140, which terminate on one side in cog-wheels. (Not shown.) The uppermost bar in the series is provided with a pulley or sprocket and is actuated by a belt or chain from a small engine 141, which is energized by steam received from the boiler 40 through the pipe 142.

The entire space 50 beneath the chambers 20 and 30 constitutes an air-tempering chamber. It is provided at the rear end with two conduits or pipes 51 51, which lead from the outer air underneath the boiler plant, and with two other conduits or pipes 52 52, which lead upwardly through the wall 100 and into the space underneath the grate 14

of the principal furnace. Two other pipes 53 53 lead upward from the front end of the chamber 50 into the space underneath the grates 13 13.

5 The mode of using my improved furnace is as follows: First, when the steam-plant is not employed the passage-way 27 is closed by lowering the damper 270, and the flue 28, leading to the chimney, is opened by raising  
10 the damper 280. Fires are then started in the principal-furnace chamber 10 and the secondary-furnace chamber 20. The feed-openings 12 12 are then opened, and the garbage or other material to be cremated is  
5 thrown upon the platform 15 and the grate 14. The watery constituents of the garbage are gradually evaporated, the garbage dried, and put into condition to be used as fuel. The dry garbage upon the front portion of  
20 the platform 15 will fall down upon the grate 14, and some of it will fall through the openings in the platform 15 into the chamber 20 beneath the same. A portion of it will naturally also fall upon the platform or horizontal diaphragm 24. The gases constituting  
25 the partial products of combustion and which are generated in the chamber 10 pass around the rear end of the platform 15 and above the platform 24 into the chamber 20 and pass thence underneath the platform 24  
30 to the chamber 30, serving in their passage further to heat the material upon the platform 24 and also that upon the platform 15. The products of the partial combustion which takes place in the chamber 20 pass  
35 some of them upward through the perforations in the platform 15, some of them between the platforms 15 and 24, and some of them beneath the platform 24, all in time reaching the chamber 30. In this chamber  
40 they pass upward alongside of the vertical wall 25 and through the perforations with which it is provided and finally pass downward again in the flue 28 and thence to the chimney. After all of these operations the  
45 heat derived from the combustion of the fuel employed and of the garbage and other materials burned serves to heat the platforms 15 and 24, the floor 240, the walls 11 of the chamber 10, and the walls 101, 31, and 33 of  
50 the chamber 30 and the vertical wall 25 of this last-named chamber until they constitute a thoroughly-heated solid body, tending to set fire to anything brought into contact therewith. The vertical wall 25 in effect be-  
55 comes red hot, and thus serves to create a draft which draws the products of combustion from the front to the rear end of the apparatus.

60 Supposing now that it is desired to use the supplemental steam plant in connection with this apparatus, the damper 270 is raised to afford a communication between the chamber 30 and the combustion-chamber 41 beneath the boiler 40 and the damper 280 is

lowered, closing the connection between the flue 28 and the chimney. When this has been done, the heated gases coming from the chamber 30 serve to heat the water in the boiler 40 and to generate steam therein. 70 They then pass upward into the flue 45 and thence into the chimney. The steam thus generated in the boiler is by means of the pipe 46 and its connection turned into the pipes 51 51 in the form of a jet. It forces 75 the air in these pipes or conduits into the chamber 50, beneath the floor 240 of the apparatus, and in turn forces it on and upward through the pipes 52 in the wall 100 (shown in dotted outline in Fig. 1) and through the  
80 pipes 53, (shown also in dotted outline in Fig. 1,) thus introducing the air from the chamber 50, where it has been heated by its contact with the floor 240 of the apparatus, underneath the grates 14 and 13. The intro- 85 duction of this heated air underneath these grates helps to promote the efficiency of the combustion which takes place above the grates, to more thoroughly and rapidly burn the material on the grates, and to effect a 90 saving in the energy derived from the combustion of the things burned in the furnace.

Where a large mass of garbage is to be treated quickly, it may be and often is desirable that it should be subjected to a rather 95 fierce heat at first. For this purpose it is fed into the apparatus through the feed-aperture above the grate 14, and means are provided for rotating the grate-bars of this grate so as to facilitate the descent of the garbage 100 and to expose it the more thoroughly to the action of the heated air rising upward from beneath the grate. For this purpose the means above described for rotating the bars is employed. If the steam-generating plant 105 is not in use and it is desirable to rotate the grate-bars, this may be accomplished by turning the sprocket or pulley attached to the uppermost bar by hand.

The apparatus described uses up more 110 completely the energy derived from the burning of the garbage than any similar form of apparatus known to me. The reversion of the currents of the products of combustion, their passage through the smoke-consuming 115 chamber 30, and their use when desired in the generation of steam, which in turn is used to provide means for forcing air heated within the apparatus under the grates of the principal combustion-chamber, all tend to 120 use up portions of the heat energy developed in the apparatus which have not heretofore to my knowledge been usefully employed.

What I claim as new is—

1. A garbage-furnace comprising a principal 125 furnace, a secondary furnace, a smoke-consuming chamber, an air-tempering chamber adjacent to and deriving its heat from the furnaces, a steam-generating plant actuated by the energy derived from the combustion 130

of the fuel in the furnaces, and a connection between the air-tempering chamber and the steam-generator.

2. A garbage-furnace comprising a principal furnace, a secondary furnace, a smoke-consuming chamber, an air-tempering chamber adjacent to and deriving its heat from the furnace, and means adapted to force the air heated therein to and beneath the grates of the furnaces consisting of a boiler heated by the gases coming from the furnaces and a valve-controlled conduit leading from the steam-space of the boiler to the air-tempering chamber.

3. A garbage-furnace comprising a principal furnace, a secondary furnace, a smoke-consuming chamber, an air-tempering chamber adjacent to and deriving its heat from the furnaces, conduits leading from the outer air to said air-tempering chamber and means adapted to put a fluid-pressure upon the air in said conduits, to draw it into the conduits and force it to and beneath the grate-bars of the furnaces.

4. A garbage-furnace comprising a principal furnace, a secondary furnace, a smoke-consuming chamber, an air-tempering chamber adjacent to and deriving its heat from the furnaces, conduits leading from the outer air to said air-tempering chamber and means adapted to put a fluid-pressure upon the air in said conduits, to draw it into the conduits and force it to and beneath the grate-bars of the furnaces, consisting of a steam-jet discharging into the conduits leading from the outer air to the air-tempering chamber.

5. A garbage-furnace comprising a principal furnace, a secondary furnace, a smoke-consuming chamber, an air-tempering chamber adjacent to and deriving its heat from the furnaces, a steam-generating plant actuated by the energy derived from the combustion of the fuel in the furnaces, conduits leading from the outer air to said air-tempering chamber, and means adapted to put a fluid-pressure upon the air in said conduits to draw it into the conduits and force it to and beneath the grate-bars of the furnaces.

6. A garbage-furnace comprising a principal furnace, a secondary furnace, a smoke-consuming chamber, an air-tempering chamber adjacent to and deriving its heat from the furnaces, a steam-generating plant actuated by the energy derived from the combustion of the fuel in the furnaces, conduits leading from the outer air to said air-tempering chamber, and means adapted to put a fluid-pressure upon the air in said conduits to draw it into the conduits and force it to and

beneath the grate-bars of the furnaces, consisting of a pipe leading from the steam-space in the steam-generating plant to the air-conduits leading from the outer air to the air-tempering chamber and valves whereby the steam may be discharged from said pipe into said conduits.

7. In a furnace of the class described, a garbage-receiving platform, a fuel-grate, an inclined grate leading downward from the said platform to the fuel-grate, air-feeding means, means for moving the garbage down said inclined grate and means for subdividing the space beneath the grates whereby the amount of air fed to each grate may be separately regulated.

8. In a furnace of the class described, a garbage-receiving platform, a fuel-grate, an inclined grate leading downward from the said platform to the fuel-grate, means for moving the garbage down said inclined grate and heating the same from beneath while on the grate by an uprushing column of heated air and means for subdividing the space beneath the grates whereby the amount of air fed to each grate may be separately regulated.

9. In a furnace of the class described, a garbage-receiving platform, a fuel-grate beneath the level of the same, an inclined grate comprising revolving bars leading from the platform to the fuel-grate, an air-tempering chamber, means for forcing air heated in said chamber through the inclined grate and means for subdividing the space beneath the grates whereby the amount of air fed to each grate may be separately regulated.

10. In a furnace of the class described, a garbage-receiving platform, a fuel-grate beneath the level of the same, an inclined grate comprising revolving bars leading from the platform to the fuel-grate, an air-tempering chamber, means for forcing air heated therein upwardly through the said inclined grate consisting of a steam-generating plant actuated by the energy derived from the combustion of the fuel in the furnace and a pipe leading from said plant to the air-tempering chamber whereby steam under pressure is introduced therein and means for subdividing the space beneath the grates whereby the amount of air fed to each grate may be separately regulated.

In testimony whereof I affix my signature in presence of two witnesses.

BENJAMIN BOULGER

Witnesses:

ALAN McDONNELL,  
HERMAN MEYER.