

No. 609,227.

Patented Aug. 16, 1898.

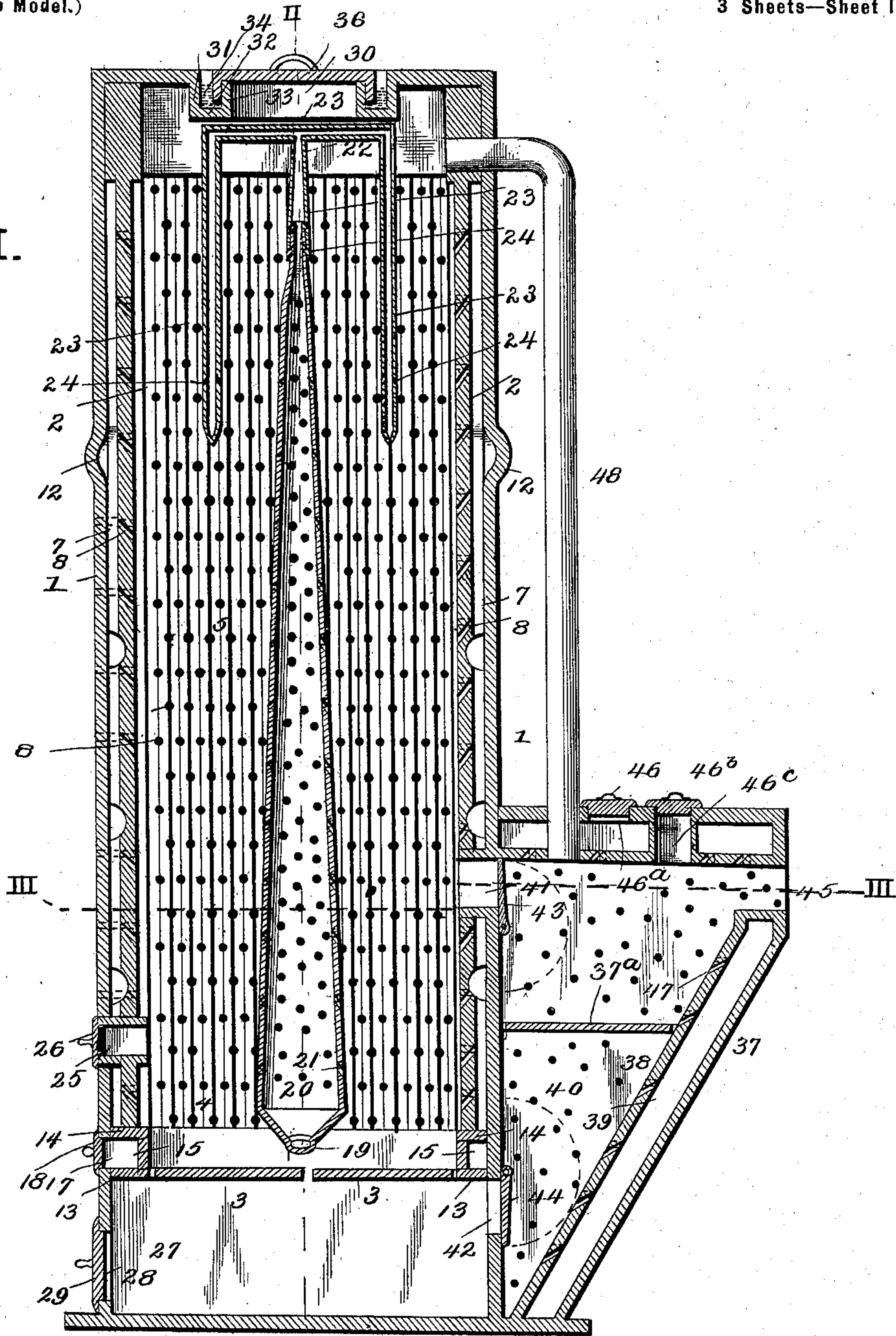
N. J. CAREY.  
HEAT GENERATOR.

(Application filed May 2, 1892.)

(No Model.)

3 Sheets—Sheet I.

Fig. I.



Witnesses  
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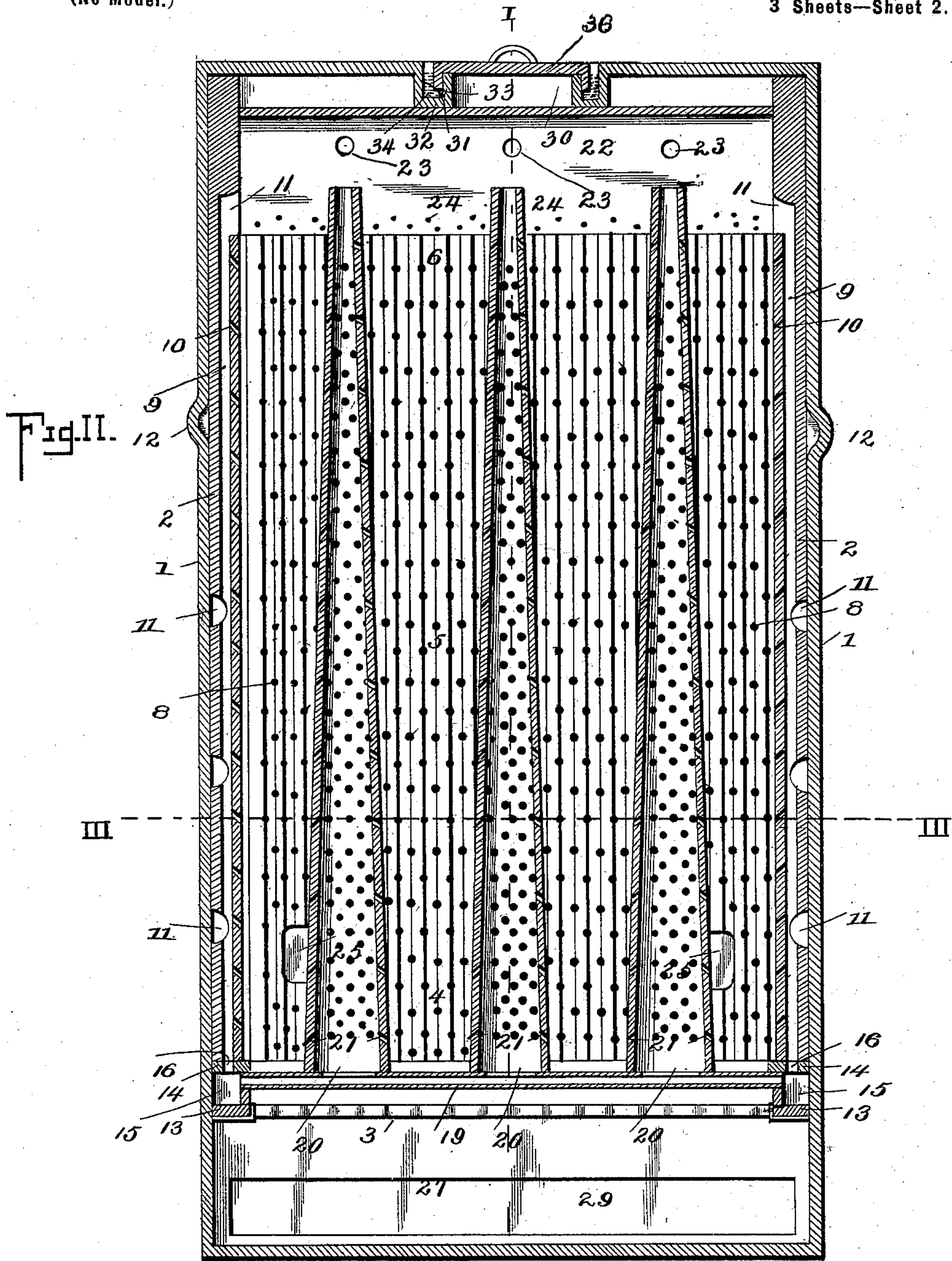
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3 Sheets—Sheet 2.



Witnesses

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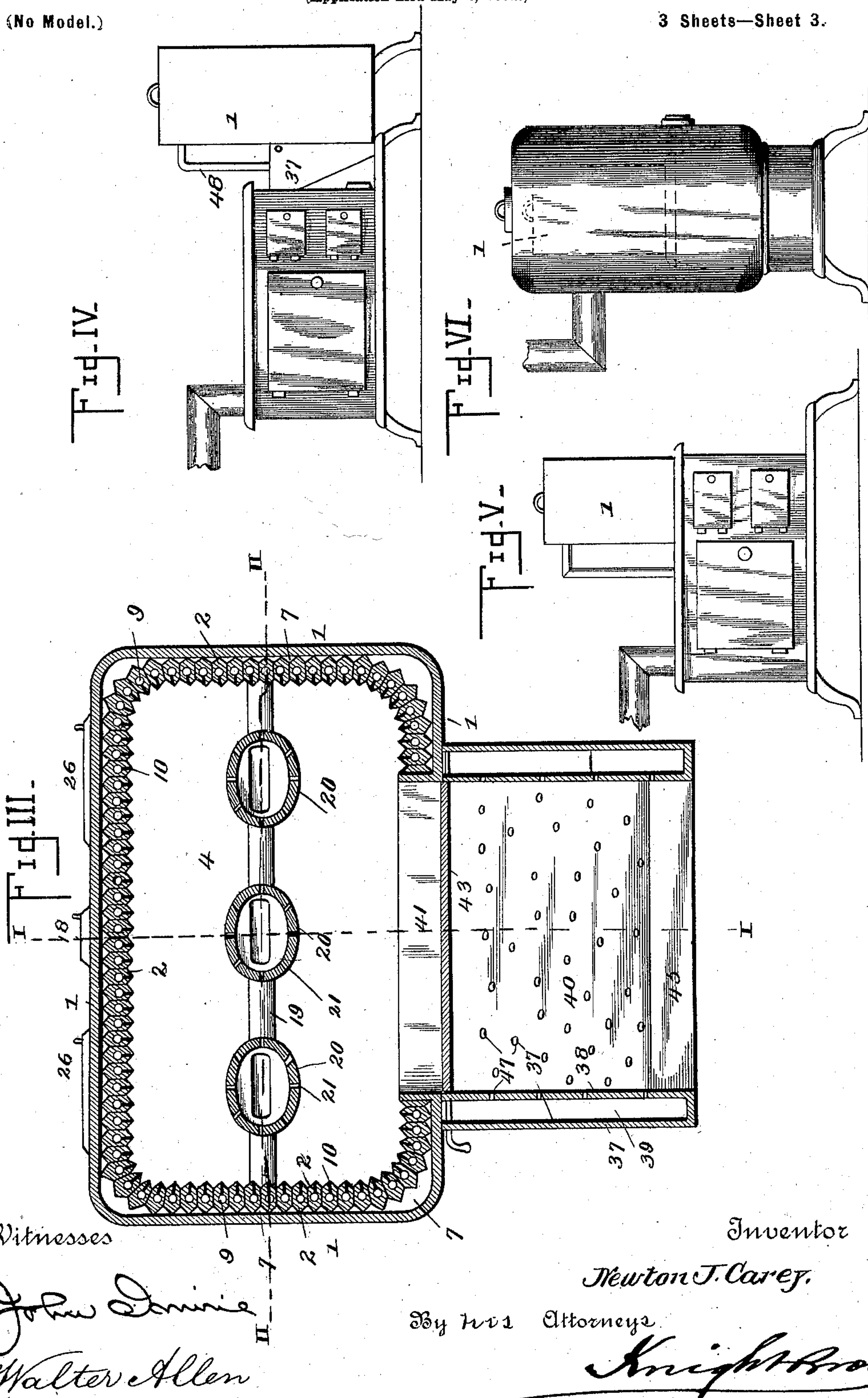
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3 Sheets—Sheet 3.



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# UNITED STATES PATENT OFFICE.

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## HEAT-GENERATOR.

SPECIFICATION forming part of Letters Patent No. 609,227, dated August 16, 1898.

Application filed May 2, 1892. Serial No. 431,505. (No model.)

*To all whom it may concern:*

Be it known that I, NEWTON J. CAREY, a citizen of the United States, and a resident of Oskaloosa, in the county of Mahaska and State of Iowa, have invented certain new and useful Improvements in Heat-Generators, of which the following is a specification.

The object of my invention is to provide a magazine heat-generator adapted to the consumption of coal-slack, bituminous, and other cheap and low grades of fuel with little or no smoke and to avoid, in a large degree, soot, dirt, and other disagreeable or objectionable conditions resulting from the use of such coal as fuel and which may be adapted to be used alone or attached or connected with heating or cooking stoves, heating-furnaces, boilers, or any other apparatus where heat is desired.

My invention consists in novel features of construction, as hereinafter described and claimed.

In order that my invention may be fully understood, I will proceed to describe it with reference to the accompanying drawings, in which—

Figure I is a vertical section of my improved heat-generator on the line I I, Figs. II and III. Fig. II is a vertical section on the line II II, Figs. I and III. Fig. III is a horizontal section on the line III III, Figs. I and II. Fig. IV is a side elevation showing the application of my invention to the end of a cooking-stove. Fig. V is a side elevation showing it applied to the top of a cooking-stove. Fig. VI is a side elevation showing it applied to a heating-stove.

My heat-generator is preferably constructed of fire-brick or iron walls 2, forming a chamber, and with suitable grates 3. This fuel-chamber in its action is substantially divided into what might be termed a "fire-chamber" 4, a "coking-chamber" 5 above the fire-chamber, and a "magazine" 6 above the coking-chamber, the division between the fire-chamber and the coking-chamber being preferably marked by a draft or smoke flue for the egress of the products of combustion. Outside of the walls forming the fuel-chamber is preferably located a casing 1, leaving a space between it and the fuel-chamber to provide a vertical air-chamber 7, which may be entirely circumferential or may be divided into air-ducts by

outside sustaining-ribs. The coking-chamber is perforated with a large number of inwardly and preferably downwardly inclined air holes or passages 8 and 10 extending there-through to form connection between the ducts or chambers 7 and the fuel-chamber.

In Figs. II and III the vertical passages are shown and constructed in the body of the wall of the fuel-chamber. In Fig. I they are shown as communicating with a circumferential air-space between the wall of the casing and the fuel-chamber.

Short air holes or passages 10 are shown in Figs. II and III as intermediate between the other inclined air-holes 8, the short air-holes forming a connection between the vertical air-ducts 9 and the fuel-chamber. The air-chamber 7 and air-ducts 9 connect at their upper ends and with, if desired, drop air-flues 24 within the coking-chamber.

11 indicates circumferential air-flues which may be used for the purpose of connecting the vertical air-ducts 9 within the lining with the vertical air-ducts 7 between the lining and the shell. The casing is preferably formed with an enlargement 12 around the coking-chamber to form the air-passage for connecting the vertical air-ducts 7. A circumferential air-supply flue 15, formed between plates 13 and 14, is constructed at or near the bottom of the lining, which forms a common chamber supplying the vertical air-ducts or vertical air-passages 9 through perforations 16. Air is admitted to the circumferential flue through an opening 17 in front of the generator, which is controlled by draft valve or door 18. If desired, for the purpose of admitting more air than can be obtained through the circumferential walls and the openings 8 and 10 an interior draft-flue or set-off draft-flues or air-columns 20, made of fire-brick or iron, extend interiorly upwardly through the fire-box and coking-chamber and connect at their bottoms with a horizontal flue 19 between or under the grates. In the walls of the air-columns 20 are also located a large number of small air-passages 21, which connect the interior of the air-columns with a fire-chamber and coking-chamber. At the top of the air-columns there may be located an air-box 22, through which the heated air is discharged by means of air-holes 24 into the coking-



chamber. 25 represents openings extending to the front of the shell and the walls of the fire-chamber, through which the fire may be built, observed, and stirred. They are closed off by doors 26. 27 indicates the ash-pit, having an opening 28, adapted to be closed by a door 29. The fuel-chamber is fed through an opening 30 in the top of the shell. This opening is preferably made air-tight by a pendent ring 31, with a horizontal flange 32, and a collar 33 surmounting the flange and forming a trough 34, in which liquid may be placed to provide a water seal and render the opening air-tight when the cover 36 is applied; but any effective means of sealing the opening against the pressure of air or the products of combustion could be utilized. As a receptacle for water to provide vapor for the apartment in which the heat-generator is placed is often desirable, the means specified would accomplish this object and also that of sealing the opening. It will be observed that this construction as a whole provides a fuel-chamber with means at one end for receiving a charge of fuel into a magazine and means at the other end of discharging the unburned residue, together with the various appliances necessary for controlling the draft, observing the fire, and regulating it, and that the draft which furnishes the burning fuel with air is one that is as evenly distributed throughout the mass of the unburned fuel as is possible to make it, due to the large number of small orifices through which said draft is drawn into the fuel-chamber. Preferably the arrangement is such that the air furnished through this multiplicity of small orifices to feed the fire is, after the fire is once started, heated. Hence even if the supply of fuel be wet or contain a large amount of gas, as in the case of soft coal, it is dried and coked and the air intermingled with the gases generated before or as soon as the fuel reaches what might be termed the "fire-chamber," thus enabling perfect combustion to be carried on in the fire-chamber. The heating of the inflowing air is an important feature, although it is possible to carry on the combustion and the operation with some fuels without it, as it is well known that an inflowing draft of air into a furnace tends to cool the furnace down, especially if such draft is allowed to inflow from above the grates, and by heating the air in the manner specified I avoid this and at the same time place the heated air in direct contact with the cold fuel above, thereby vaporizing the moisture, raising it to the high degree of temperature, and gradually, as the fuel descends, coking the contents of the magazine in the coking-chamber. At the same time I supply an abundant supply of oxygen to burn all of the gases, as well as the coke that is formed.

It is obvious that the form of the heat-generator might be changed very materially without departing from the principles and mode of operation above stated and that it may be

supplemented, if desired or found necessary, by other devices or by attachments such as hereinafter described. The generator, however, described might be used, as hereinbefore stated, with a cook-stove, as shown in Figs. IV and V, or it may be used alone, the draft-flue to the chimney being attached directly to it through the opening 41. It is obvious, however, that a downdraft is essential. The draft-flue to carry away the smoke and products of combustion could not be connected with and lead out of the fuel-chamber at any point above the coking-chamber, although it may be placed anywhere between the top of what is substantially the coking-chamber and the grates.

In order to complete, if found necessary, the combustion and completely burn all of the combustible gases generated, an attachment may be added at the lower part and on the rear side of the generator, consisting of a projection or an enlargement having a shell 37 and a lining 38, forming between them an air-space 39. The lining provides a combustion-chamber 40, which connects with the interior of the fuel-chamber through the draft-flue 41 and also with the ash-pit by the opening 42. These openings may be provided with adjustable dampers 43 and 44.

Located in the combustion-chamber 40 is a grate 37<sup>a</sup>, which is adapted to catch and hold until consumed any pieces of coke which may be drawn from the fire-chamber into this combustion-chamber 40.

45 is the draft-flue leading from the combustion-chamber 40, through which the products of combustion pass and through which heat may be supplied to a stove or furnace or a boiler.

46 is an adjustable opening in the top of the shell 37, admitting air to the space 38, surrounding the lining.

46<sup>c</sup> is an opening through the shell leading into the interior of the combustion-chamber, which is closed by the cover 46<sup>b</sup>.

The lining 33 is perforated with small holes 47 for the admission of air to the combustion-chamber to aid and complete the combustion. As many times a large amount of gas will be developed at and during the replenishing of the fuel, I preferably provide a pipe 48, extending from the magazine to the top of the chamber 40, to carry off this gas and burn it in chamber 40. While all of the air-holes might be horizontal, yet I prefer to have them inclined, as they are kept clear and not so liable to get choked.

In operating this device kindling is first placed in the fire-box, which may be ignited from either the firing-door or ash-pit, the draft-door connecting with the air-supply flues being closed, as is also the damper in the opening leading from the ash-pit, air being supplied through ash-pit door. On igniting the kindling the generator is fired with charcoal or nut-coal through an opening in the top of the generator until the top of the fire is burning



above the flue 41. The coking-chamber, including the magazine, is then filled to the top with the fuel to be consumed, and the top opening is closed and the air-supply opened. The rate of burning may be regulated as may be desired by means of the various dampers.

In the perforated form the draft-flue 41, through which the products of combustion pass, is placed between the coking-chamber and the fire-pot, as thus the gases and products of combustion during the coking are led off and do not pass through the burning coke below, whereas the burning coke receives fresh air from the draft-holes below this exit 41 or through the grates, as may be desired. In fact, the air-holes 8 and 10 below the exit of the products of combustion might be omitted without particular detriment, as by the time the fuel has reached that point it is expected to be completely coked and the gas products burned off. Hence there is not the same necessity for furnishing the air in the same way and to the same degree that there is to the unburned fuel above, which is undergoing the process of drying and coking as it descends. It would not be a departure from my invention, however, to have the draft-flue 41 located nearly or quite on a level with the grates.

Having thus described my invention, the following is what I claim as new therein and desire to secure by Letters Patent:

1. In a heat-generator, a fuel-chamber having an opening at or near the upper end for the admission of fuel, an opening at or near the other end for removing the unburned residue, an intermediate opening to a draft-chimney, a circumferential series of draft-holes in the upper part of the walls composing the fuel-chamber and above the opening to the draft-chimney, and an adjustable draft in the lower portion of the chamber and upon the opposite end relative to the fuel-chamber and flue; substantially as described and for the purpose set forth.

2. In a heat-generator, the combination of a casing having means for the introduction of fuel at or near one end and means for the withdrawal of unburned residue at or near the opposite end, an intermediate flue leading to the draft-chimney, an internal air-flue extending above said intermediate flue and adapted to be surrounded by fuel, a multiplicity of draft-holes in said air-flue, a circumferential series of draft-holes above the intermediate flue in the walls of the casing, means for regulating the amount of air entering the air-flue, and means for regulating the amount of air delivered by the holes in the casing; substantially as described.

3. In a heat-generator, the combination of a fuel-chamber having an opening at or near its upper end for the admission of fuel, an opening at or near the lower end for the discharge of unburned residue, an intermediate draft-flue to discharge the products of combustion, an air-tube adapted to be surround-

ed by fuel and depending downwardly from the upper end of the generator, and adapted to discharge air into the fuel above the intermediate draft-flue; substantially as described.

4. A heat-generator, consisting of a fuel-chamber, means for the admission of fuel at its upper end, means for the withdrawal of unburned residue at its lower end, a jacket surrounding said fuel-chamber and extending to or near its upper end and uniting thereto and forming an air-chamber, adjustable means for admitting air to the lower end of said air-chamber, a multiplicity of draft-openings through the walls of the fuel-chamber above the smoke-draft therefrom, and adjustable means for permitting air to enter the fuel-chamber below the smoke-draft therefrom, substantially as and for the purpose described.

5. A heat-generator, consisting of a fuel-chamber adapted to admit fuel at its upper end, and adapted to discharge unburned residue at its lower end, an intermediate smoke-flue leading to a chimney, perpendicular flues formed in the walls thereof having adjustable means for admitting air at their lower ends, and closed at their upper ends, a series of perforations or draft-holes from said flues to the interior of the fuel-chamber above the draft-flue, and an adjustable air-draft leading into the lower portion of the chamber below the draft-flue, substantially as and for the purpose described.

6. The combination, with a shell or casing; of a lining providing a fire-chamber and a coking-chamber and formed with air-holes extending from the outer side to the inner side, with vertical air-ducts within the body extending from the bottom to the top thereof, and with short air-holes extending from the vertical air-ducts to the inner side of the lining; substantially as described.

7. The combination, with a shell or casing; of a lining providing a fire-chamber and a coking-chamber arranged within the shell or casing having air-ducts between it and the shell or casing and formed with vertical air-ducts within the body extending from the bottom to the top thereof; substantially as described.

8. The combination, with a shell or casing; of a lining providing a fire-chamber and a coking-chamber arranged within the shell or casing, having air-ducts between it and the shell or casing, and formed with air-holes extending from the outer side to the inner side and with vertical air-ducts within the body extending from the bottom to the top thereof; substantially as described.

9. The combination, with a shell or casing; of a lining providing a fire-chamber and a coking-chamber arranged within the shell or casing having air-ducts between it and the shell or casing and formed with air-holes extending from the outer side to the inner side, with vertical air-ducts within the body ex-



tending from the bottom to the top thereof, and with short air-holes extending from the vertical air-ducts to the inner side of the lining; substantially as described.

5 10. The combination, with a shell or casing; of a lining providing a fire-chamber and a coking-chamber arranged within the shell or casing having air-ducts between it and the shell or casing and formed with vertical air-  
10 ducts within the body extending from the bottom to the top thereof and recesses by which the air-ducts between the shell or casing and the lining and the vertical air-ducts in the lining are connected; substantially as  
15 described.

11. The combination, of a lining providing a fire-chamber and a coking-chamber, having air-ducts on the outer side thereof and a shell or casing formed with an enlargement which  
20 surrounds the lining and connects the air-ducts; substantially as described.

12. The combination, with a shell or casing, and a lining providing a fire-chamber and a coking-chamber; of the air-supply flue, the  
25 horizontal flue extending beneath the fire-chamber and connected to the air-supply flue, and the vertical air-column extending from the horizontal flue through the fire-chamber and into the coking-chamber and formed with  
30 air-holes connecting the interior of the air-column with the surrounding fire and coking chambers; substantially as described.

13. The combination, with a shell or casing and a lining providing a fire-chamber and a coking-chamber, of the air-supply flue, the  
35 horizontal flue extending beneath the fire-chamber, and connected to the air-supply flue, and the upwardly-tapering vertical air-column extending from the horizontal flue through the fire-chamber and into the coking-  
40 chamber and formed with air-holes connecting the interior of the air-column with the surrounding fire and coking chambers; substantially as described.

45 14. The combination, with a shell or casing and a lining providing a fire-chamber and a coking-chamber; of the air-supply flue, the horizontal flue extending beneath the fire-  
50 chamber and connected to the air-supply flue, and vertical air-columns extending from the horizontal flue through the fire-chamber and into the coking-chamber, having drop-  
burners at their upper ends; substantially as described.

55 15. The combination, with a shell or casing and a lining providing a fire-chamber and a coking-chamber; of the air-supply flue, the horizontal flue extending beneath the fire-  
60 chamber and connected to the air-supply flue and the vertical air-columns extending from the horizontal flue through the fire-chamber and into the coking-chamber having air-tubes provided with drop-burners which are formed  
with air-holes; substantially as described.

65 16. The combination, with the shell or casing and a lining providing a fire-chamber and a coking-chamber, having a flue extending

from the coking-chamber through the lining, and through the shell or casing and an opening from the ash-pit extending through the  
70 shell or casing; of the projection or enlargement formed with a lining providing a combustion-chamber, and with a heat-discharge opening; substantially as described.

17. The combination, with the shell or cas- 75  
ing and a lining providing a fire-chamber and a coking-chamber having a flue extending from the coking-chamber through the lining and through the shell or casing and an opening  
80 from the ash-pit extending through the shell or casing; of the projection or enlargement consisting of a shell having an air-inlet, and a lining providing a combustion-chamber within an air-space between it and the shell  
85 and formed with air-holes for admitting air from the space to the combustion-chamber; the lining and shell being provided with a heat-discharge opening; substantially as described.

18. In a heat-generator, consisting of a fuel- 90  
chamber, means for the admission of fuel at one end, means for the withdrawal of unburned residue at the other end, with intermediate smoke-flue to discharge the products of combustion, one or more air-tubes adapted  
95 to be surrounded by fuel and having openings for the entry of air into the fuel above the smoke-flue, and a multiplicity of air-openings in the walls of the generator; substantially as described.

19. In a heat-generator consisting of a fuel- 100  
chamber, means for the admission of fuel at its upper end, means for the withdrawal of unburned residue at the lower end, an intermediate draft-opening for the discharge of the products of combustion, an air-box ex-  
105 tending across the fuel-chamber above said opening to the chimney, and provided with openings to admit air to the fuel above said opening to the chimney, substantially as described. 110

20. In a heat-generator consisting of a fuel-  
chamber, draft-openings for the admission of air thereto, a draft for the products of combustion leading therefrom, a subcombustion-  
115 chamber located in the line of said draft, an air-chamber located above said subcombustion-chamber and having downdraft-openings suitable for delivering air to the top of the flame and gases proceeding from the main combustion-chamber, substantially as 120  
described.

21. In a heat-generator, a fuel-chamber having an opening at or near its upper end for admission of fuel, an opening at or near the other end for withdrawal of unburned  
125 residue, an intermediate opening to a draft-chimney, a circumferential series of draft-openings between opening for fuel and the draft-opening to the chimney; substantially as described.

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