

No. 773,328.

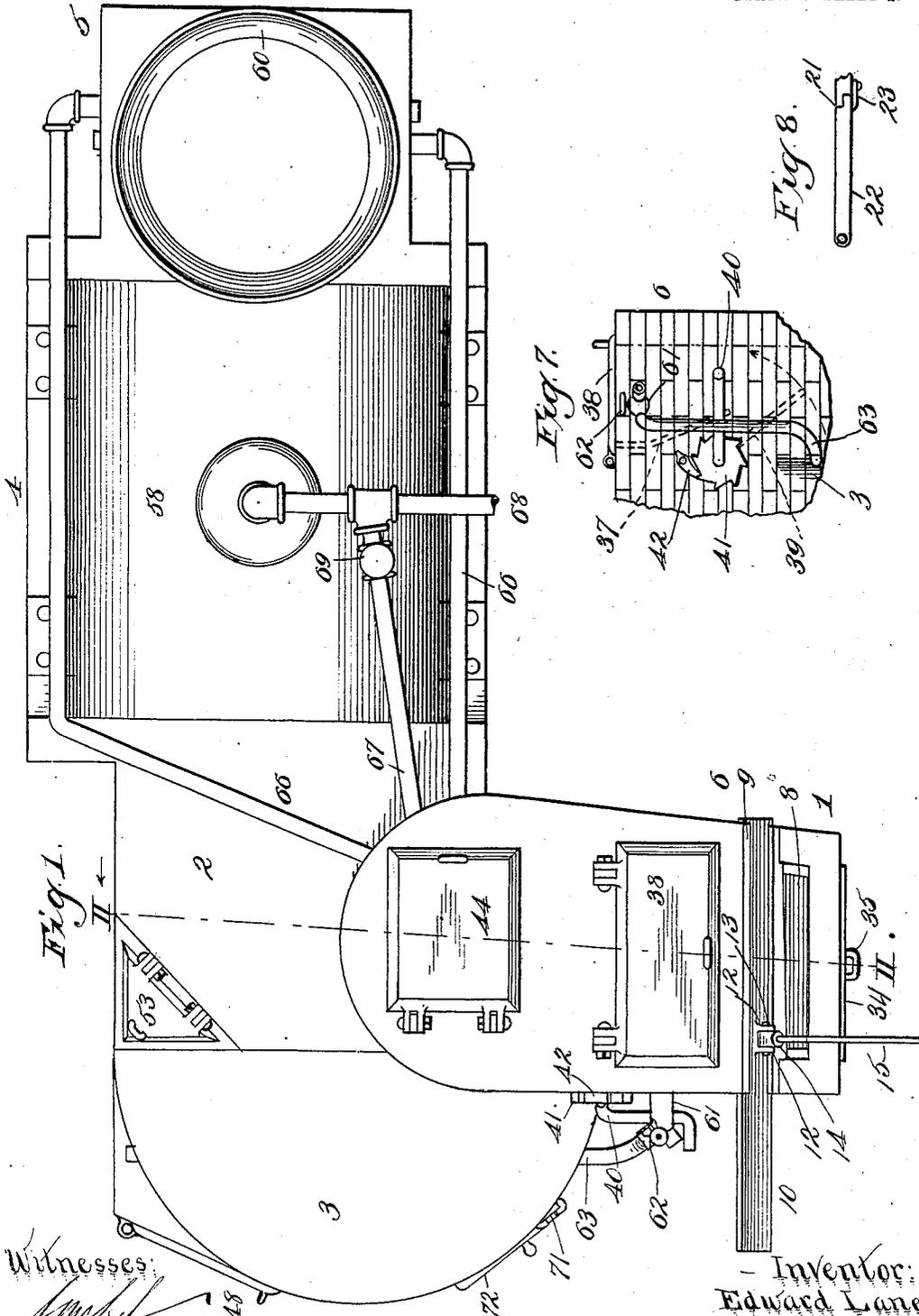
PATENTED OCT. 25, 1904.

E. LANE.
FURNACE.

APPLICATION FILED FEB. 6, 1904.

NO MODEL.

4 SHEETS—SHEET 1.



Witnesses:
A. M. [Signature]
F. P. [Signature]

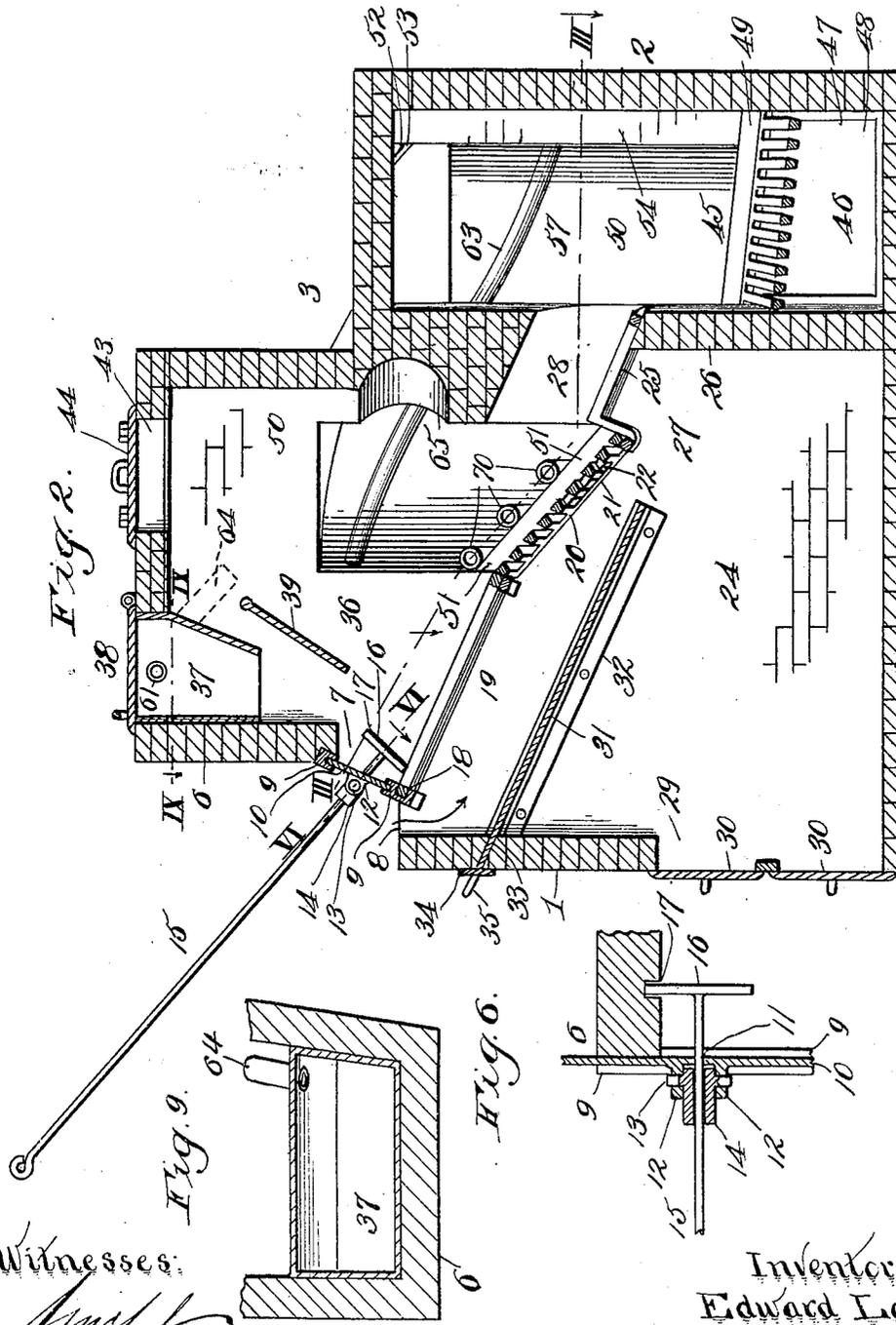
Inventor:
 Edward Lane
George [Signature]
 Atty.

E. LANE.
FURNACE.

APPLICATION FILED FEB. 6, 1904.

NO MODEL.

4 SHEETS—SHEET 2.



Witnesses:
A. M. [Signature]
F. R. [Signature]

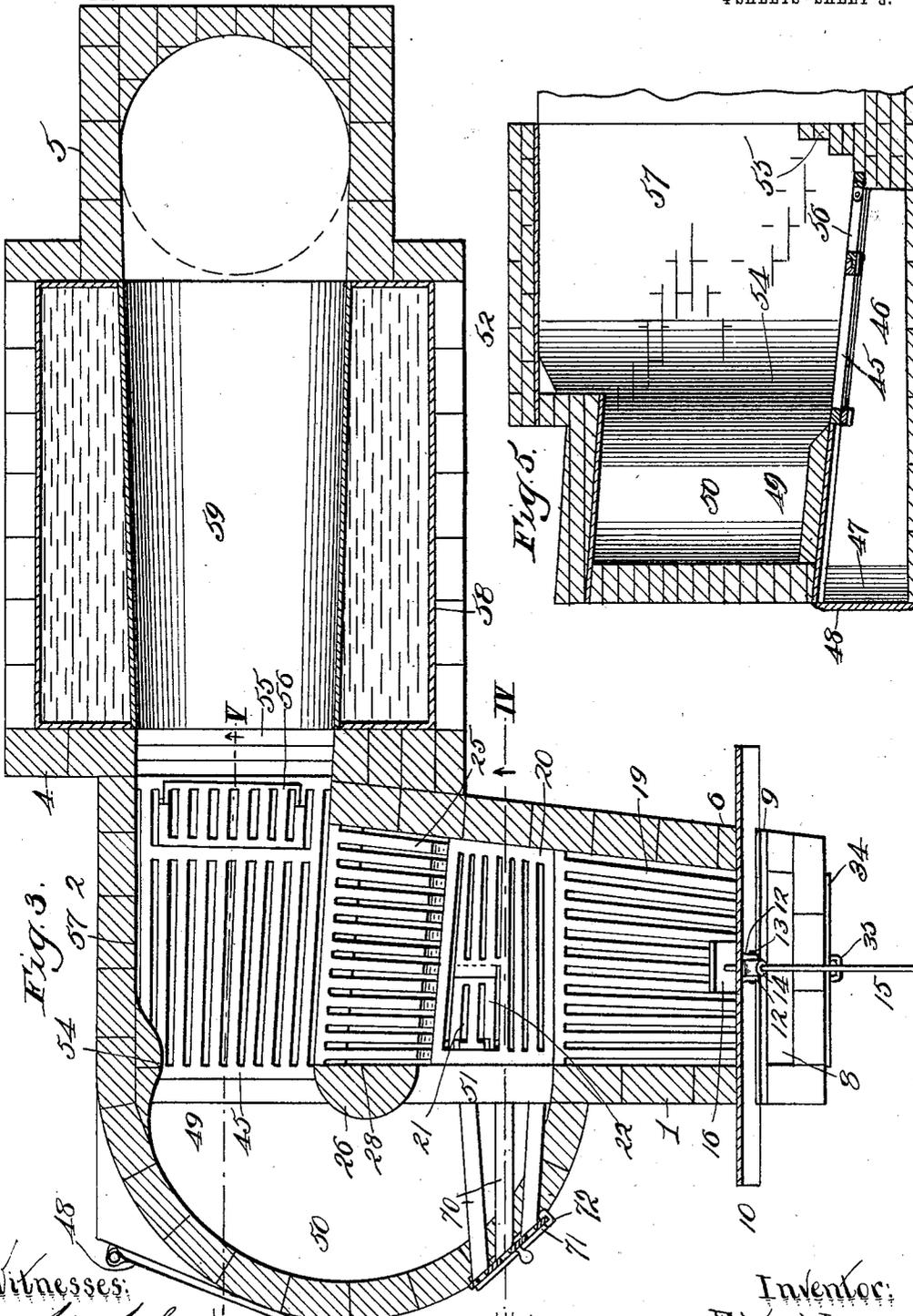
Inventor:
 Edward Lane
[Signature]
Atty.

E. LANE.
FURNACE.

APPLICATION FILED FEB. 6, 1904.

NO MODEL.

4 SHEETS—SHEET 3.



Witnesses:

A. M. [Signature]
J. P. [Signature]

Inventor:
Edward Lane

George [Signature]
 Atty.

E. LANE.
FURNACE.

APPLICATION FILED FEB. 6, 1904.

NO MODEL.

4 SHEETS—SHEET 4.

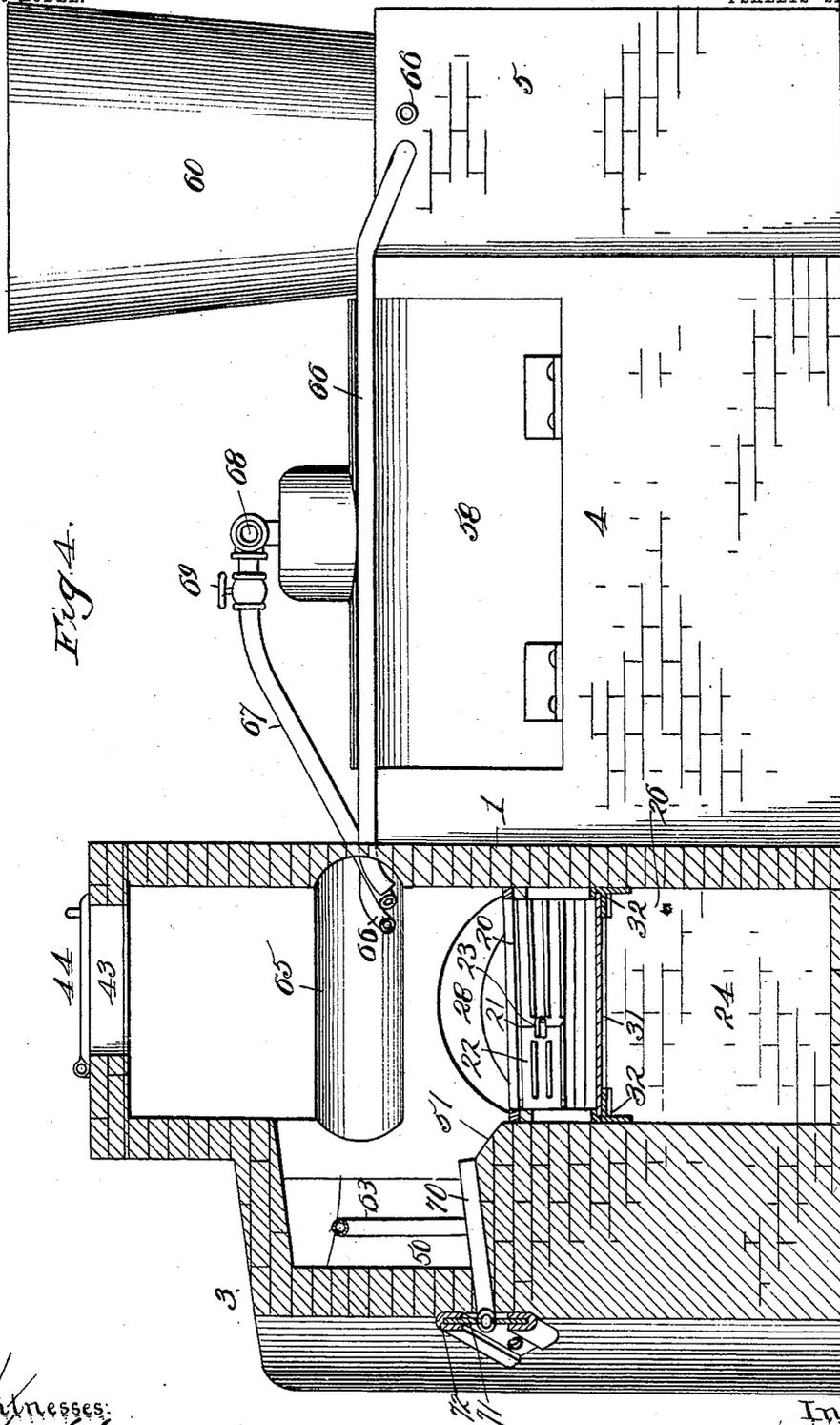


Fig. 4.

Witnesses:

Wm. H. ...
J. C. ...

Inventor:

Edward Lane

By *George ...*

Att.

UNITED STATES PATENT OFFICE.

EDWARD LANE, OF KANSAS CITY, MISSOURI.

FURNACE.

SPECIFICATION forming part of Letters Patent No. 773,328, dated October 25, 1904.

Application filed February 6, 1904. Serial No. 192,461. (No model.)

To all whom it may concern:

Be it known that I, EDWARD LANE, a citizen of the United States, residing at Kansas City, in the county of Jackson and State of Missouri, have invented certain new and useful Improvements in Furnaces, of which the following is a specification.

My invention relates to furnaces; and my object is to produce a furnace which will consume the combustible gases which ordinarily escape and in such action also consume practically all the smoke which arises.

With this and other objects in view, as hereinafter appear, the invention consists in certain novel and peculiar features of construction and organization, as hereinafter described and claimed, and in order that it may be fully understood reference is to be had to the accompanying drawings, in which—

Figure 1 is a top plan view of a furnace embodying my invention. Fig. 2 is a section on the line II II of Fig. 1. Fig. 3 is a section on the line III III of Fig. 2. Fig. 4 is a section on the line IV IV of Fig. 3. Fig. 5 is a section on the line V V of Fig. 3. Fig. 6 is a section on the line VI VI of Fig. 2. Fig. 7 is an elevation showing the means for securing the coal-regulating door at the desired position of adjustment. Fig. 8 is a detail edge view of the grate-door and also shows, broken away, the contiguous portion of the grate and the turn-button for locking the grate-door closed. Fig. 9 is a section on line IX IX of Fig. 2.

In the said drawings, where like reference characters designate corresponding parts, 1 designates the front portion, 2 the rear portion, 3 the end portion, 4 the boiler portion, and 5 the smoke-stack portion, of the furnace.

The front portion of the furnace at a suitable height has its front wall set back, as at 6, the step or jog thus formed in the front wall providing an opening 7 and an opening 8. Parallel grooved bars 9, secured in the furnace-wall, one on the top of opening 7 and the other at the back of opening 8, carry a slide-plate 10 and in conjunction with said plate keep opening 7 always closed, the slide-plate considerably exceeding the width of the front portion of the furnace, for a purpose hereinafter explained. Said slide-plate is provided

with a central slot 11 and at opposite sides of said slot with forwardly-projecting apertured lugs 12, wherein are pivoted the trunnions 13 of a sleeve 14, said sleeve carrying slidingly a rod 15, provided at its inner end with a head 16, which normally rests in the groove 17 in one of the side walls of the furnace, this groove preventing any accidental movement of the "push-rod," as it is hereinafter termed, because it is utilized to push the coal into the furnace in case it should not feed automatically with the required regularity. By the construction described it will be obvious that the rod can be pivotally operated in a vertical plane and at the same time reciprocate with the slide-plate 10, and it will also be noticed, by reference particularly to Figs. 1, 3, and 6, that by sliding plate 10 the push-rod is pushed laterally across the furnace, so as to give access to the entire body of fuel. Because of this, the slide-plate is of sufficient length to keep the opening 7 bridged irrespective of the position of the push-rod.

The lower grooved bar for plate 10 also forms the front support for the grate-section 19, the grate-bars of which are pitched downwardly and rearwardly and slightly diverge in order to correspond with the divergence of the side walls of the front portion of the furnace, this divergence showing clearly in Figs. 1 and 3 and being for the purpose of providing increased space to accommodate the expansion of the gases as the heat increases, said continuously-expanding chamber therefore facilitating the progress of the gases and smoke.

20 is a grate-section, preferably pitched downward and rearward at a greater angle than section 19, the grate-bars of section 20 running transversely and also sloping slightly downward to the left. Said grate-section is provided at its lower rear corner with an opening 21, normally closed by a door-section 22 of the grate, said door being held in its closed position by means of the turn-button 23 or its equivalent, carried by the contiguous portion of the grate. Through this opening clinkers and ashes are adapted to be precipitated down into the ash-pit 24 of the front portion of the furnace.

Rearward of grate-section 20 and also pitched downward and rearward is a third grate-section 25, said grate-section having its rear end resting on the partition-wall 26, separating the front from the back portion of the furnace. The front portion of section 25 is higher than the rear portion of section 20 and is provided with a depending portion 27, attached to the lower rear edge of section 20 and forming a shoulder at the rear of said section, which will arrest clinkers and ashes to prevent them from passing on section 25 through the arched opening 28 of wall 26.

To give access to the ash-pit, the front opening 29 is closed by doors 30, of the usual or any preferred type, and occupying the ash-pit chamber and extending approximately parallel with and below grate-section 19 is a slidable partition-plate 31, said partition-plate being mounted, by preference, in grooved cleats 32, secured to the inner wall of the furnace, the side edges of said plate being substantially parallel, so that it can be slid forward through the slot 33 in the front wall when it is desirable to obtain access to grate-sections 19 and 20 from below.

The sliding partition has a stop 34 at its front end to limit rearward movement and a handle 35 for convenience of operation. The slide-plate terminates short of the grate-door 22, so as not to interfere with the opening and closing of the latter, and is designed to form an air-passage to direct the cold air entering opening 8 against the bottom of the grate.

In the upper front portion of the combustion-chamber 36 is a fuel-hopper 37, controlled by a door 38. At the top of the furnace and below said hopper is a swinging door 39 to regulate or altogether check, if desirable, the passage of fuel from the hopper onto the grate-section 19. This swinging door 39 has a crank-handle 40 projecting through one wall of the furnace, and said handle is provided with a ratchet-wheel 41, adapted to be secured against accidental movement by the pivoted dog 42.

Rearward of the hopper the back wall of the furnace is provided with an opening 43, controlled by a hinged door 44, said opening being provided chiefly to enable the attendant to inspect the interior of the furnace.

In the rear portion of the furnace, which runs transversely of the front portion and which provides for expansion by having its walls diverge in the direction of the stack portion, as shown clearly in Fig. 3, is a grate 45, which grate is adapted to receive incandescent fuel through the arched opening 28, said grate-section being also pitched downwardly toward the stack portion. Access to the ash-pit chamber 46 of said auxiliary furnace, as it is in fact, is obtained through the opening 47, normally closed by door 48, said ash-pit chamber being bridged from its higher

end to the doorway by partition 49, which partition forms the bottom of the substantially semicircular flue 50, connecting the front furnace with the rear furnace. The point of communication with the front furnace, as shown clearly, is opposite the depressed side of grate-section 20, and at such point of connection an inclined wall 51 forms a shoulder or abutment to prevent the fuel entering said flue.

Access to the combustion-chamber of the rear furnace for sight purposes primarily is through the triangular opening 52, controlled by door 53. Flue 50, like the furnace-chambers, expands continuously from its receiving to its delivery end, and at the last-named end its back wall is increased in thickness to form a deflector 54, said deflector being for the purpose of causing the smoke and gases passing through the flue and entering the rear furnace-chamber to be deflected forwardly over that portion of the grate contiguous to the arched opening, where the fire is hottest and where it will be almost entirely consumed.

At the opposite or lower end of the grate 45 rises the abutment or wall 55, which serves to hold the incandescent fuel upon said grate until it is entirely consumed, and at the lower end said grate is provided with a door 56, through which clinkers may be removed, though in practice it has been found that the heat is so intense in the auxiliary furnace that clinkers do not form.

The delivery end of the combustion-chamber 57 of the rear or auxiliary furnace opens into the boiler-chamber 4, the boiler 58 being supported in the usual or any preferred manner and having a central flue 59, which extends from its receiving to its delivery end and at the latter communicates with the smoke-stack portion 5, in which the lower end of the smoke-stack 60 is secured. Said smoke-stack, like the boiler, expands toward its delivery end.

Extending through a side wall of the furnace and into the magazine is a Y-shaped pipe 61, the fork of the pipe being about half the capacity of its body and provided with a valve 62, by which either fork can be completely closed or so adjusted that air may pass through both forks simultaneously into the magazine, one of the forks being adapted to receive cool air and the other hot air from pipe 63, which extends through the flue 50 and communicates with the external air at the rear of the furnace, said air being heated in its passage through the flue, and said pipe 63 is pitched upwardly and forwardly, by preference, to facilitate circulation. The air entering the magazine is for the purpose of conveying the smoke and gases which are generated therein out through the short discharge-pipe 64, said pipe being disposed, by preference, at the opposite end of the magazine from pipe 61 and pitched downwardly and rearwardly, so as to

discharge such smoke and gases toward and upon the mass of burning fuel and at the side of the grate remote from flue 50 in order to compel such smoke and gases to pass over the fire for about its entire width, and thus give the fire a better opportunity to consume the smoke and combustible gases.

To stimulate circulation, the front furnace is provided with a channel or groove 65, formed in the wall most remote from the flue 50 and which curves around in the arch wall above the arch and communicates with flue 50, hot air being delivered into the furnace in the plane of said flue by the pipes 66, which extend along by the boiler and through the stack portion 5, so that the air passing through said pipes shall be heated by the impingement on the pipes of the gases passing up into the stack, which, in connection with a furnace of the type described, is preferably of short length. To mix with the hot air thus delivered into the furnace, so as to form a combustible gas which will act to effect the complete consumption of the smoke, superheated steam is conducted from the boiler, through a pipe 67, to the furnace, the discharge end of the pipe being contiguous to the corresponding ends of pipes 66. Pipe 67 is connected with the steam-pipe 68 and has a valve 69 to regulate the amount of steam passing through pipe 67 or to entirely cut off such supply of steam, if desirable. To supply additional air to the furnace, which will tend to disseminate the smoke over the hottest portion of the fire and to mix therewith and with the gases to more reliably insure the burning thereof, I provide one or more pipes 70, these pipes heating the air, because they extend through flue 50 for more or less distance. Furthermore, they are pitched upwardly and inwardly, so that the draft shall be forcible enough to cause the air to be thoroughly mixed with the smoke and gases and to prevent the latter escaping through said pipes. An apertured slide 71, mounted in a grooved guide-frame 72, secured to the furnace externally, is employed to close said pipes or open them more or less, as required.

In operation a fire is built upon the front furnace-grate in the customary manner until the mass of incandescent fuel approximates in depth the height of the arch, so as to practically close the arch passage to anything but incandescent fuel, a percentage of the latter falling or being pushed by push-rod 15 through said passage onto the auxiliary furnace-grate 45. The magazine is kept charged with fuel at all times and the door 39 adjusted to regulate the feed therefrom to the grate below. When desired, said valve can be used to entirely cut off the passage of such fuel. Should the fuel stick, as it usually does, more or less, the operator manipulates the push-rod 15, in the manner hereinbefore explained, to dislodge such fuel and push it down upon

the grate-sections 20 and 25. A fierce fire and thorough combustion is supported in the furnace, because of the large supply of oxygen entering at so many different points, the main draft passing down through opening 8 and up through the grate. The supplemental draft through the magazine 6 discharges smoke formed therein down onto the fire. The supplemental draft through pipes 70 tends to disseminate or spread such smoke, so as to check its movement and give the fire a better opportunity to consume it and the gases mixed with it. The pipes 66 and 67 not only act to force such suspended smoke close down upon the incandescent fuel, but also produce a combustible gas by the mixture of superheated steam and air, which adds to the intensity of the fire, and thus acts to effect the complete and thorough combustion of the smoke and gases. The comparatively small volume of smoke and gases which escape through flue 50 enter the rear furnace-chamber and are consumed by the incandescent fuel of the auxiliary grate, it being understood that the fire on this grate is practically smokeless, for the reason that nothing but incandescent fuel passes through the arch opening.

By virtue of the constantly-expanding front furnace, flue, and rear furnace room is provided for the constantly-expanding mixture of air, gas, and smoke in order that the force of the draft shall not be lessened by friction with a relatively contracted passage-way. It will thus be seen that the constantly-expanding passage-way by accommodating the expansion of the products of combustion creates a forced draft through the furnace to produce a fierce fire and that the means employed for forcing the smoke and gases into intimate relation with the front furnace, together with the cooperation of the auxiliary furnace, results in a substantially thorough consumption of the smoke and gases, the heated non-combustible gases passing from the last-named furnace through the constantly-expanding passage of the boiler and the smoke-stack, which stack need therefore project but a comparatively short distance above the boiler.

The clinkers can be removed from the furnace by simply projecting a poker up through the topmost section of the front grate and forcing them down onto the second grate-section and then projecting the end of the poker up through said section and forcing the clinkers down to the opening 21, through which they fall when the door 22 is opened into the ash-pit below.

To remove the clinkers from the auxiliary-furnace grate, the poker is introduced through the opening 44 and the clinkers forced down to the opening of the grate controlled by door 56, which can be opened or closed by the proper manipulation of the poker, as will be readily understood.

From the above description it will be apparent that I have produced a furnace embodying the features of advantage enumerated as desirable in the statement of the object of the invention and which may obviously be modified in various particulars without departing from the spirit and scope or sacrificing any of the advantages of the invention.

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

1. A furnace, having a front chamber and a rear chamber, an opening connecting said chambers, and a flue also connecting said chambers, said flue at its front end communicating with the side of the front chamber, a grate in the front chamber comprising a front portion, a rear portion registering with the opening and provided with a shoulder 27 at its front end, and a middle portion extending from the front portion to the rear portion, and pitched downwardly toward the latter so that its rear end occupies a lower plane than the front end of the rear portion.

2. A furnace, having a front portion, a rear portion, an opening connecting said portions, a flue opening through the side of the front portion and communicating at its opposite end with the rear portion, and a channel or groove in the inner side of the wall of the front portion and communicating at its delivery end with the front end of said flue, and a grate for the front portion, said grate registering at its rear end with said opening.

3. A furnace, having a front portion, and a rear portion, an opening connecting said portions, and a flue also connecting said portions, said flue opening at its front end into the side of the front portion, and a grate for the front portion, said grate comprising a front portion, a rear portion, and a middle portion, said middle portion sloping downwardly toward the wall through which said flue opens, and a door-controlled opening in the lower end of said sloping middle portion of the grate.

4. A furnace, having a front portion, a rear portion, an opening connecting the front portion and rear portion, and a flue also connecting said portions and opening at its front end through the side of the front portion, and a grate for the front portion, said grate comprising a front portion having its bars extending longitudinally and pitched downwardly and rearwardly, a rear portion registering with the said opening and also pitched downwardly and rearwardly and provided with a depending portion at its front end, and a middle portion extending downwardly from the rear end of the front portion to the lower end of the depending part of the rear portion of the grate to produce a shoulder at the front end of the latter; said middle portion having its grate-bars extending transversely and terminating at a point below the plane of the lower side of the front end of said flue, and

having a door-controlled opening in its lower end.

5. A furnace comprising a front portion provided with a grate, a rear portion, a wall having an arched opening separating said portions, and a flue connected to the rear portion and communicating with the front portion at one side of and above the grate.

6. A furnace comprising a front portion provided with a grate, a rear portion, a wall having an arched opening separating said portions, and a flue connected to the rear portion and communicating with the front portion at one side of and above the grate, and having a shoulder contiguous to the grate to prevent the fuel entering the flue.

7. A furnace, comprising a front portion provided with a grate, a rear portion, a wall having an arched opening separating said portions, a flue connected to the rear portion and communicating with the front portion at one side of and above the grate and having a shoulder contiguous to the grate to prevent the fuel entering the flue, and a valve-controlled pipe extending upwardly and inwardly through the flue, and terminating about in the plane of the mouth of the latter.

8. A furnace, comprising a front portion provided with a grate, a rear portion, a wall having an arched opening separating said portions, a flue connected to the rear portion and communicating with the front portion at one side of and above the grate and having a shoulder contiguous to the grate to prevent the fuel entering the flue, a pipe extending upwardly and inwardly through the flue and terminating about in the plane of the mouth of the latter, and a slide plate or valve controlling the opposite end of said pipe to exclude air passing therethrough into the furnace when desired.

9. A furnace, comprising a front portion provided with a grate and having its combustion-chamber increasing in cross-sectional area toward its rear end, a rear portion, a wall having an arched opening separating said portions, and a flue connected to the rear portion and communicating with the front portion at one side of and above the grate; said flue increasing in cross-sectional area from its front toward its rear end.

10. A furnace, comprising a front portion provided with a grate and having its combustion-chamber increasing in cross-sectional area toward its rear end, a rear portion having a grate and also having its combustion-chamber of increasing cross-sectional area from the front toward the rear end of the grate, a wall separating said portions, and having an arched opening above said grates, and a flue communicating with the front combustion-chamber at one side, and with the rear combustion-chamber at its front end; said flue increasing in cross-sectional area from its point of communication with the front com-

bustion-chamber to its point of communication with the other combustion-chamber.

11. A furnace, comprising a front portion provided with a grate and having its combustion-chamber increasing in cross-sectional area toward its rear end, a rear portion having a grate and also having its combustion-chamber of increasing cross-sectional area from the front toward the rear end of the grate, a wall separating said portions, and having an arched opening above said grates, a flue communicating with the front combustion-chamber at one side, and with the rear combustion at its front end; said flue increasing in cross-sectional area from its point of communication with the front combustion-chamber to its point of communication with the other combustion-chamber, and an upwardly-flaring stack having its lower end communicating with the delivery end of the second combustion-chamber.

12. A furnace, comprising a front portion provided with a grate and having its combustion-chamber increasing in cross-sectional area toward its rear end, a rear portion having a grate and also having its combustion-chamber of increasing cross-sectional area from the front toward the rear end of the grate, a wall separating said portions, and having an arched opening above said grates, a flue communicating with the front combustion-chamber at one side, and with the rear combustion-chamber at its front end; said flue increasing in cross-sectional area from its point of communication with the front combustion-chamber, to its point of communication with the other combustion-chamber, an upwardly-flaring stack having its lower end communicating with the delivery end of the second combustion-chamber, and a boiler interposed between the second combustion-chamber and the stack and having its flue of increasing cross-sectional area, from its front or receiving to its rear or delivery end.

13. A furnace, comprising a front portion provided with a grate and having its combustion-chamber increasing in cross-sectional area toward its rear end, a rear portion having a grate and also having its combustion-chamber of increasing cross-sectional area from the front toward the rear end of the grate, a wall separating said portions, and having an arched opening above said grates, a flue communicating with the front combustion-chamber at one side, and with the rear combustion-chamber at its front end; said flue increasing in cross-sectional area from its point of communication with the front combustion-chamber, to its point of communication with the other combustion-chamber, an upwardly-flaring stack having its lower end communicating with the delivery end of the second combustion-chamber, a boiler interposed between the

second combustion-chamber and the stack and having its flue of increasing cross-sectional area from its front or receiving to its rear or delivery end, and a wall or shoulder between the rear end of the grate of the second combustion-chamber and the front end of the boiler-flue.

14. A furnace, comprising a front portion provided with a grate having its combustion-chamber increasing in cross-sectional area toward its rear end, a rear portion having a grate and also having its combustion-chamber of increasing cross-sectional area from the front toward the rear end of the grate, a wall separating said portions, and having an arched opening above said grates, a flue communicating with the front combustion-chamber at one side of the same, and at its rear end with the front end of the rear combustion-chamber; said flue increasing in cross-sectional area from its point of communication with the front combustion-chamber to its point of communication with the other combustion-chamber, an upwardly-flaring stack having its lower end communicating with the delivery end of the second combustion-chamber, a boiler interposed between the second combustion-chamber and the stack and having its flue of increasing cross-sectional area from its front or receiving to its rear or delivery end, a wall or shoulder between the rear end of the grate of the second combustion-chamber and the rear end of the boiler-flue, and a door-controlled opening in the rear end of the grate of the second combustion-chamber.

15. A furnace comprising a front portion having a grate, a rear portion having a grate extending transversely of the front grate and occupying a lower plane than the same, an opening connecting the front and rear portions above said grates, a flue opening into the side of the front portion, and into the front end of the rear portion, and a deflecting-wall at the front end of the rear portion above its grate.

16. A furnace comprising a front portion having a grate, a rear portion having a grate extending transversely of the front grate and occupying a lower plane than the same, an opening connecting the front and rear portions above said grates, a flue opening into the side of the front portion, and into the front end of the rear portion, a deflecting-wall at the front end of the rear portion above its grate, door-controlled openings for said grates, and doors controlling communication with the ash-pit chambers below said grates.

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

EDWARD LANE.

Witnesses:

H. C. RODGERS,
G. Y. THORPE.